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MUNICIPAL, INDUSTRIAL AND DOMESTIC WATER SUPPLIES, POLLUTION ABATEMENT, PUBLIC HEALTH. CHOCTAWHATCHEE-PERDIDO PASIN

Public Health Service
Atlanta, Georgia

June 1962

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CHOCTAWHATCHEE
PERDIDO BASIN

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TECHNICAL MEMORANDA
FOR
WATER SUPPLIES
POLLUTION ABATEMENT
AND
PUBLIC HEALTH

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PREPARED FOR
UNITED STATES STUDY COMMISSION, SOUTHEAST RIVER BASINS
BY
DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE, REGION IV
WATER SUPPLY & POLLUTION CONTROL PROGRAM
ATLANTA, GEORGIA
JUNE 1962

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UNITED STATES DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service, Region IV
Water Supply and Pollution Control Program

Technical Memoranda
for
Municipal, Industrial and Domestic Water Supplies
Pollution Abatement
Public Health

CHOCTAWHATCHEE-PERDIDO BASIN

Prepared for

United States Study Commission,
Southeast River Basins
Atlanta, Georgia
June 1962

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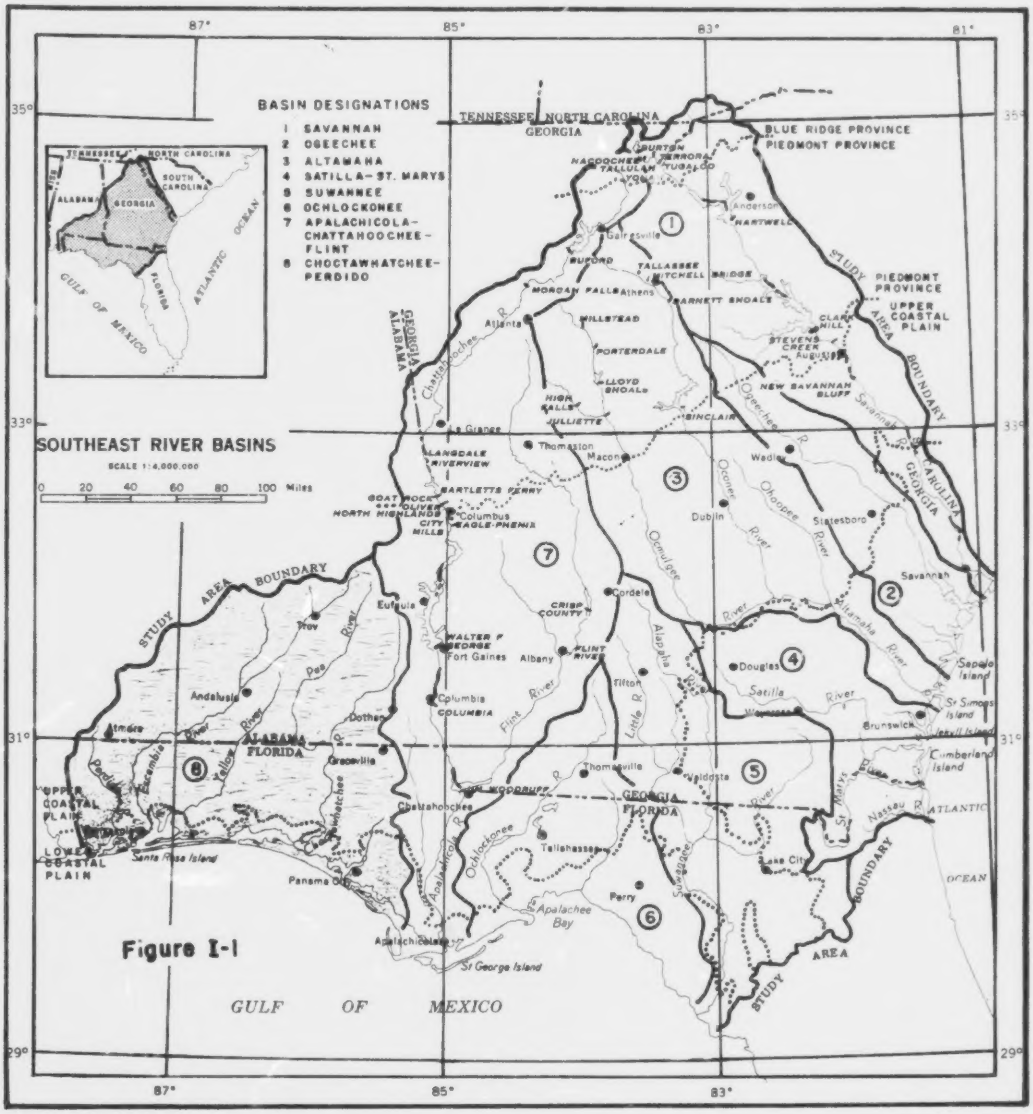
SOUTHEAST RIVER BASINS
SCALE 1:4,000,000
0 20 40 60 80 100 Miles
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1 SAVANNAH
2 OGEECHEE
3 ALTAMAHA
4 SATILLA–ST. MARYS
5 SUWANNEE
6 OCHLOCKONEE
7 APALACHICOLA–CHATTAHOOCHEE–FLINT
8 CHOCTAWHATCHEE–PERDIDO
TENNESSEE
NORTH CAROLINA
GEORGIA
SOUTH CAROLINA
ALABAMA
FLORIDA
ATLANTIC OCEAN
GULF OF MEXICO
BLUE RIDGE PROVINCE
PIEDMONT PROVINCE
UPPER COASTAL PLAIN
LOWER COASTAL PLAIN
STUDY AREA BOUNDARY
Atlanta
Gainesville
Athens
Anderson
Augusta
Macon
Columbus
La Grange
Thomaston
Dublin
Wadley
Statesboro
Savannah
Cordele
Albany
Eufaula
Fort Gaines
Columbia
Tifton
Douglas
Waycross
Brunswick
Valdosta
Thomasville
Tallahassee
Perry
Lake City
Dothan
Troy
Andalusia
Atmore
Graceville
Chattahoochee
Panama City
Apalachicola
Sapelo Island
St Simons Island
Jekyll Island
Cumberland Island
Santa Rosa Island
St George Island
Apalachee Bay
87°
85°
83°
81°
35°
33°
31°
29°

Figure I-1

U. S. Study Commission, Southeast River Basins
P. O. Box 953, Atlanta 1, Georgia

PREFACE

SCOPE

The U.S. Study Commission, Southeast River Basins, on December 30, 1959 and March 11, 1960, requested the assistance of the Public Health Service in:

(1) Formulating a domestic, municipal and industrial water supply plan, including pertinent economic studies,

(2) Formulating a water quality management plan including water pollution abatement and pertinent economic studies, and

(3) Formulating a plan for the protection of public health related to plans for the conservation, utilization, and development of land and water resources of the study area.

The Study Commission proposed that the Public Health Service compile the required basic data and prepare "single-purpose technical memoranda" on each of the above subjects and that these technical memoranda set forth the requirements for development to serve the above functions at present, in 1975, and 2000 in each of the eight river basins of the study area.

These memoranda on the Choctawhatchee-Perdido Basin have been prepared in fulfillment of the Commission's requests. They have been divided into three separate memoranda: MUNICIPAL, INDUSTRIAL, AND DOMESTIC WATER SUPPLIES; POLLUTION ABATEMENT; and PUBLIC HEALTH. In addition, a separate report has been prepared by the Public Health Service for the U.S. Study Commission: Water Quality Basic Data-Southeast River Basins, dated 1961. This report covers the Choctawhatchee-Perdido Basin as well as the seven other Basins within the U.S. Study Commission study area.

The purpose of these memoranda is to provide data and information to the U.S. Study Commission-SERB on the present and projected status of the water supply, pollution abatement, and public health facilities and programs for use in the preparation of a comprehensive plan for the conservation, utilization, and development of the land and water resources of the Choctawhatchee-Perdido Basin.

AUTHORITY

The Study Commission's requests are in partial fulfillment of its obligation under Public Law 85-850 which states in part: "In carrying out the purpose of this Act it shall be the policy of Congress to utilize the services, studies, surveys, and continuing investigational programs of the departments, bureaus, and agencies of the United States". The Act also states that the Commission may "secure directly from any executive department, bureau, agency, commission, office, independent establishment, or instrumentality, information, suggestions, estimates, and statistics for the purpose of this Act, and each such department, bureau, agency, board, commission, office establishment, or instrumentality is authorized to furnish such information, suggestions, estimates and statistics directly to the Commission, upon request by the Chairman or Vice Chairman".

The authority for the Public Health Service to undertake this study and the preparation and submission of these technical memoranda stems from the above and from the Public Health Service Act of 1944 (Public Law 410, 78th Congress) and its amendments; the Federal Water Pollution Control Act (Public Law 660, 84th Congress), and its amendments; Federal legislation on air pollution (Public Law 159, 84th Congress), with amendments; related miscellaneous provisions of other statutes; and the Public Health Service Regulations.

Public Law 85-850, under which the U.S. Study Commission operates, provides for investigations and studies and the preparation of a comprehensive and coordinated plan for the conservation, utilization, and development of land and water resources in the study area. In this plan formulation, the law specified, among other things, the inclusion of plans for:

(1) domestic and municipal supplies;

(2) possibilities of industrial development and utilization;

(3) pollution abatement and the protection of public health; and

(4) other beneficial and useful purposes.

ECONOMIC BASIS FOR PLANNING

Projections for 1975 and 2000 in this report were made using estimates of economic development furnished to the Public Health Service by the U.S. Study Commission, Southeast River Basins. The pattern of the future economy stems mainly from projections of population, employment, and income furnished by the Commission. The basic aggregate projections for these three components are considered by the Commission to be relatively firm. The breakdown of the basic projections into their different components and the derivation of data for river basins is based, in some cases, on limited information. The Commission emphasizes that these are preliminary estimates and that the pattern of the projected economy should not be taken as a rigid goal but should be considered flexible and subject to modification and refinement as the results of future studies become available.

RESPONSIBILITIES

The basic responsibility for the administration of Federal programs in municipal water supply, pollution control, and public health is vested in the Public Health Service. State programs and responsibilities are administered by the State health departments and water pollution control agencies. In the administration of these Federal and State programs, cooperation and assistance of other agencies with interests in these fields are obtained. The responsibilities and interests of all Federal, State, and local agencies in municipal water supply, pollution control and public health programs in the Choctawhatchee-Perdido Basin are enumerated below.

PUBLIC HEALTH SERVICE, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

The Public Health Service serves in a consulting capacity to other Federal agencies and to the State and local health departments on matters relating to water supply, water pollution control, vector control, and other matters related to public health; makes investigations and studies; does scientific research in the above fields; collects vital statistics; and operates certain medical care and quarantine programs. In protecting the public health, the Service is responsible for developing and recommending procedures for the prevention and control of mosquitoes and other vectors associated with Federal water development projects.

As part of its responsibilities under the Federal Water Pollution Control Act (Public Law 660, 84th Congress) as amended, the Service is required to prepare or develop in cooperation with other Federal agencies, State and interstate water pollution control agencies, municipalities and industries, comprehensive programs for eliminating or reducing the pollution of interstate waters and tributaries thereof and improving the sanitary conditions of surface and underground waters. In the development of such comprehensive programs, due regard is given to the improvements which are necessary to conserve such waters for public water supplies; propagation of fish and aquatic life and wildlife; recreational purposes; and agricultural, industrial, and other legitimate uses. The Service is further authorized to advise any Federal construction agency concerning the inclusion of storage in any proposed reservoir for regulations of stream flow for the purpose of water quality control.

The Public Health Service is authorized to make joint investigations, with any such agencies, of the condition of any waters in any State or States, and of the discharge of any sewage, industrial wastes, or substance which may adversely affect such waters. Section 8 (a) of Public Law 660 states that "The pollution of interstate or navigable waters in or adjacent to any State or States (whether the matter causing or contributing to such pollution is discharged directly into such waters or reaches such waters after discharge into a tributary of such waters), which endangers the health or welfare of any persons shall be subject to abatement as provided in this Act."

The Public Health Service works closely with State agencies and makes investigations and studies relating to health and pollution control aspects of development programs pertaining to municipal, industrial, and domestic water supplies. The Service also has the responsibility of collecting and disseminating basic data on radiological, chemical, physical, and biological water quality and other information insofar as such data and information relate to water pollution and the prevention and control thereof.

CORPS OF ENGINEERS, DEPARTMENT OF THE ARMY

The Corps of Engineers operates the Federal program for the improvement and maintenance of rivers and other waterways in the interest of navigation and flood control. Water conservation and other water use functions beneficial to the public are considered in carrying out investigations and construction of water projects. Health matters relating to these projects include vector control, sanitation of work camps, recreation, water supplies, and water pollution abatement.

SOIL CONSERVATION SERVICE, DEPARTMENT OF AGRICULTURE

The Soil Conservation Service, under Public Law 566, 83rd Congress, as amended, prepares watershed work plans for small watersheds to assure water-flow retardation and soil erosion prevention. In the development of these work plans, consideration is given to water use functions beneficial to the people of the area, including irrigation, stock watering, and fish and wildlife propagation and municipal and industrial water supply. Control of insects around the watershed and use of water for domestic purposes are also given consideration.

FOREST SERVICE, DEPARTMENT OF AGRICULTURE

The Forest Service is responsible for the development and management of National Forests to preserve and increase the multiple benefits from these natural resources. Good forest management retards rapid runoff and prevents soil erosion, thus reducing pollution from natural sources. Sanitation of public facilities in National Forests is under the supervision of the Forest Service and privately operated facilities are regulated by use permits issued by the Service. It is to be noted, however, that Section 480, Title 16, U.S. Code states that jurisdiction over persons within National Forests should not be affected by the reason of these forests' existence. Thus, health and sanitation in National Forests is of concern to State and local health authorities.

GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

The Geological Survey is primarily a fact finding and research agency. It collects, analyzes, and interprets basic data on water, mineral, and land resources, and prepares topographic and geological maps and reports as a prerequisite to planning, constructing, and operating projects for the development and utilization of these natural resources.

NATIONAL PARK SERVICE, DEPARTMENT OF THE INTERIOR

The National Park Service administers programs for the National Parks, monuments, historic sites, and similar areas. It has the responsibility for maintaining sanitary and healthful conditions in these areas. The Service cooperates with other agencies in investigating the recreational possibilities at proposed reservoir projects and in planning for their protection, development, and utilization.

ATOMIC ENERGY COMMISSION

The Atomic Energy Act of 1954 authorizes the Atomic Energy Commission to regulate the use of certain radioactive materials and certain facilities, which produce or use these materials, to protect against hazards to life or property. A National Committee on Radiation Protection, comprised of members of several Federal agencies including the Public Health Service and professional organizations, prepares recommendations on protection from radioactive substances.

ALABAMA STATE BOARD OF HEALTH

The Alabama Board of Health is authorized to adopt and issue rules and regulations establishing proper methods and details for administering the health and quarantine laws of the State. These rules and regulations have the force and effect of law (Title 22, Section 7). Functions of the Board include establishment of water purity standards, enforcement of regulations governing impoundment of waters, cooperation in ground and surface water surveys, and studies of water use and consumption (Title 22, Section 7,9,11,117-129, 131,135-140).

In general, the State Board of Health is responsible for the general supervision and control of all water supplies and waterworks in the State insofar as purity, potability, wholesomeness, and physical quality of waters furnished may affect the public health or comfort. In this connection the Board consults and advises municipal authorities and other persons engaged in waterworks installation and improvement as to appropriate sources of supply and methods of assuring purity. A separate statutory provision authorizes examination of sources of supply, tanks, reservoirs, pumping stations, and avenues of conveyance of drinking water, and whenever these waters are found polluted, or conditions are discovered likely to bring about their pollution, proper steps are taken to improve or correct these conditions.

Permits are issued by the Board to supply water for human consumption or domestic uses, and investigations are made of proposed or existing water supplies and waterworks and plans and specifications therefor. Persons holding permits may be issued orders necessary to secure an adequate supply of safe, potable water. Orders of the Board of Health relating to water supplies and waterworks are enforced by injuction and violation may result in criminal prosecution.

ALABAMA WATER IMPROVEMENT COMMISSION

The Alabama Water Improvement Commission establishes standards for recognized limits of pollution and is responsible for developing and enforcing the water pollution control program of the State. (Code of Alabama, 1955 Supp., Title 22, Section 140). Pollution of Alabama waters is controlled and abated by the Commission through issuance of administrative orders (subject to court review) to persons responsible for the pollution, and by regulating the conditions under which sewage, industrial, and other waste may be discharged into waters of the State. The authority to control and abate water pollution is limited to what is reasonable, scientifically possible, economically feasible, and physically attainable from a practical standpoint. The State Health Department is the administrative agency for the Commission.

LOCAL HEALTH DEPARTMENTS (ALABAMA)

There are 67 county health departments which are functioning on a full-time basis. According to the statutes, county health officers are responsible for sole direction of all sanitary and public health work within the county, including incorporated municipalities.

ALABAMA OIL AND GAS BOARD

The Oil and Gas Board is directed to prevent the pollution of fresh water supplies by oil, gas, or salt water (Title 26, 1955 Supplement, Section 179).

ALABAMA DIVISION OF GAME AND FISH

Primary responsibility for protection of fish and wildlife lies with the Division of Game and Fish of the Alabama Department of Conservation. In this connection the Division maintains certain pollution control activities with regard to fish and wildlife habitat.

ALABAMA GEOLOGICAL SURVEY

This State agency cooperates with the U.S. Geological Survey and with local and state agencies on water resource studies. In connection with the collection and inventory of basic water data, the Geological Survey aids in the development of overall natural resource plans for the state.

FLORIDA STATE BOARD OF HEALTH

Rules and regulations for the betterment and protection of the public health of the State of Florida are included in the State's Sanitary Code Law (Chapter 381, Florida Statutes). The adoption, promulgation, and enforcement of this Law is the responsibility of the Florida State Board of Health. Among the 35 chapters of the Sanitary Code relating to the public health engineering and sanitation program of the State, there are included rules and regulations governing public water supplies, public sewerage systems, pollution of streams and waters, swimming pools and bathing beaches, impoundments, and private water supply wells.

Other statutes which are administered by the State Board of Health are the Tourist Camp Law (Chapter 513 Florida Statutes); The Nuisance Law (Chapter 386 Florida Statutes); Supervision by the State Board of Health over Pollution of All Underground and Surface Waters in the State and Over Water Supplies, Sewerage Systems, Sewage Waste and Refuse Disposal Systems in the State (Chapter 381 and Chapter 387, Florida Statutes); Pollution of Waters (Chapter 387 Florida Statutes); the Swimming Pool Law (Chapter 514, Florida Statutes); and the Air Pollution Control Act (Chapter 403, Florida Statutes 1957).

The Board has the authority to issue permits and review plans and specifications for the installation, alteration or extension of a water supply or sewerage system, and refuse or sewage disposal facilities to serve more than 25 people. The Board is further authorized to enforce any provisions of the Sanitary Code; conduct experiments relating to the purification of water and treatment of sewage, waste or refuse; consult with and advise counties, municipalities and other persons as to source of water supply, methods of water purification, and disposal of drainage, sewage or refuse; to establish water purity standards for the streams of the State; and to control air pollution in accordance with rules and regulations adopted by the State Air Pollution Control Commission.

LOCAL HEALTH DEPARTMENTS (FLORIDA)

In Florida, local health departments are orgainzed on a county, multicounty, or city-county basis. Health officers in charge of these local units are deputized agents of the State Health Officer for the purpose of carrying out the provisions of the Sanitary Code of the State. Local health departments have the power to enforce rules, regulations, orders, and ordinances regarding the public health in accordance with the State laws. Local health departments also have the power to make sanitary inspections and isolate, quarantine, and abate nuisances.

FLORIDA BOARD OF CONSERVATION

The State Board of Conservation, through its Department of Water Resources, advises the Florida State Cabinet on measures to conserve and promote wider use of water resources; advises and coordinates the efforts of local agencies, water control authorities, municipalities, counties, and individuals to achieve improved conservation, control, and use; and conducts an educational program to inform the public of sound state water resource policies and procedures.

FLORIDA GAME AND FRESH WATER FISH COMMISSION

The State Game and Fish Commission collects and compiles data on a biological and economic nature and recommends measures to mitigate losses or increase the value of various water control structures to wildlife. The Commission also represents fish and wildlife interests in planning of water resource projects.

FLORIDA GEOLOGICAL SURVEY

The Board of Conservation of this Agency collects and compiles basic hydrological data on water resources of the state; locates wild flowing artesian wells and with the Water Resources Department prevents waste and is the principal cooperator with the United States Geological Survey on water surveys.

WATER PURVEYORS

The general responsibility for the purity of water is shared by health authorities, water purveyors, owners of property, and water users. Those duties of health authorities and other agencies have been presented. The purveyor of water must safeguard it while in the water supply system, with some overlapping responsibilities with the property owner once the water reaches the property line. Regulations controlling the manufacturing, importing or bottling of water in the Basin is administered by the Alabama and Florida State Boards of Health.

DESCRIPTION OF THE BASIN

GENERAL

The Choctawhatchee-Perdido Basin is bounded on the west by the Mobile Bay Subbasin, on the northwest by the Alabama River Basin, on the east by the Apalachicola-Chattahoochee-Flint Basin, and by the Gulf of Mexico on the south. The four major river systems within the basin are the Perdido on the west, the Escambia-Conecuh in the west central, the Yellow in the east central and the Choctawhatchee on the eastern boundary. Basin streams drain an area of about 14,500 square miles in the Coastal Plain of southeastern Alabama and western Florida. More than half of this area, about 8,400 square miles, is within Alabama. The Choctawhatchee, Yellow, Escambia and Perdido drainage areas are 4,400; 1,350; 4,280, and 870 square miles, respectively (Figure I-1).

Smallest of the major rivers in the Basin, the Perdido rises in extreme southwestern Alabama and flows southerly into the Gulf of Mexico. In southeastern Alabama near Union Springs, the Escambia-Conecuh River forms and flows in a southwesterly direction until it empties into the Gulf near Pensacola, Florida. The Yellow River is formed by the confluence of several small streams in the northeastern portion of Covington County, Alabama. It flows southwesterly and enters East Bay also near Pensacola. The Choctawhatchee River, largest in the basin, rises in southern Alabama and flows southward toward Florida. Entering Florida the stream meanders in a southerly and then westerly direction until it enters Choctawhatchee Bay approximately 25 miles south of DeFuniak Springs, Florida.

Gently rolling hills characterize the northern portions of the Basin. These hills diminish toward the south and the flat coastal plain areas predominate in the southern section. The Gulf coastal area is extremely swampy and jungle-like in appearance.

Although no sediment data are presently available, the sand and sandy loam soils and the relief are similar to that of southwestern Georgia. It is assumed from this comparison that sediment concentrations in the Perdido-Choctawhatchee Basin are low. Medium color values, 11-50 color units, are reported for the surface waters of the Basin. The higher values are predominate in the lower Basin due to organic loading from the swampland area. Surface water in most of the Basin streams is low in dissolved solids and is soft. Salt water intrusion from the Gulf of Mexico has occurred on the Escambia River.

Hydroelectric power is generated at three sites in the area. On the Escambia-Conecuh River, Gantt and Point A Reservoirs near Andalusia, Alabama are small storage projects. A third project, Elba Reservoir, is a small pondage located on the Pea River (the major tributary or the Choctawhatchee River) about 4 miles south of Elba, Alabama. During periods of low and medium flow, these power plants create diurnal fluctuations.

CLIMATE AND HYDROLOGY

Average annual rainfall in the Basin varies from about 53 inches in the northern part to almost 66 inches in the southern portion of the Choctawhatchee-Perdido watershed. Mean annual temperatures vary from 65°F in the north to 68°F on the coast while frost free season varies from 250 to 300 days. The area is subject to both cyclonic and tropical storms, which occasionally bring excessively heavy rainfall. Severe cold weather seldom occurs and freezing temperatures rarely last longer than 48 hours. During the summer months thundershowers are common and dry sunny weather is typical of the fall season.

River flows in the major streams furnish plentiful water supplies even during dry periods. The following summary lists average, maximum, and minimum flows on the four larger rivers in the Basin. Average flow of the Yellow River at its mouth is in excess of 2,000 cfs due to tributary inflow from the Shoal River below Milligan, Florida.

		Flow in cfs		
Gaging Station	Years of Record	Avg.	Max.	Min.
Perdido River at Barrineau Park, Fla.	18	7	39,000	207
Escambia River near Century, Fla.	25	5,989	73.900	600
Yellow River at Milligan, Fla.	21	1,128	28,000	143
Choctawhatchee River near Bruce, Fla.	29	6,922	69,600	1,480

The Perdido-Choctawhatchee Basin is underlain by a number of Coastal Plain aquifers. Principal of these are the Lower Tertiary, Miocene-post Miocene, and principal (limestone) artesian. The latter aquifer is located in the southeastern quarter of the Basin.

The principal artesian aquifer, which is a source of ground water almost everywhere it occurs, consists mainly of hydraulically connected limestone beds. The thickness of the aquifer approaches 600 feet and depth to the top is approximately 500 feet.

In southeastern Alabama the tertiary aquifers are the major source of ground water for industrial, municipal, and domestic supply. These water bearing formations range from 100 to 600 feet deep and are 80 to 1,000 feet thick. Wells in this area usually are developed in such a way that they obtain water from more than one limestone and sand unit.

Miocene and post-Miocene aquifers are located in the western portion of the Florida Panhandle. These sand and gravel layers are situated within 400 feet of land surface and are 100 to 300 feet thick. Pensacola is the center of greatest pumpage in the area.

POPULATION

The total 1960 basin population from census figures supplied by the U.S. Study Commission was 692,500, an increase of 20.2 percent over the 1950 population of 575,400. Urban population in 1960 was 68.1 percent higher than in 1950, and 1960 rural population decreased by 12,000 persons during the 10 year period. Rural population in the Florida portion of the Basin actually increased from 1950 to 1960.

Pensacola, Florida is the only Standard Metropolitan Statistical Area in the Basin. The 1960 population of this municipality was 70,352. Other larger cities with their 1960 populations are: Andalusia, Alabama, 10,263; Enterprise, Alabama, 11,410; Troy, Alabama, 10,234; Brownsville, Florida, 38,417; Panama City, Florida, 33,311; and Warrington, Florida, 16,752. Total basin population is expected to more than double by the year 2000.

RESOURCES

Although the Basin economic development is primarily agricultural, shipping, fishing, tourist trade and lumber and associated activities are being rapidly expanded. Chief among the area agricultural products are peanuts, cotton, corn, truck crops, and hogs and cattle. The southern flatlands are largely uncleared and are used mostly for timber production and livestock raising.

Pensacola, the chief industrial center in the Basin, ranks as one of the most important seaports on the eastern Gulf Coast, exporting coal, fruit, and fertilizer. Panama City, Florida, is one of the largest tourist attractions in Florida, and is the center of a commercial oyster fishery. A large paper mill is also located at Panama City.

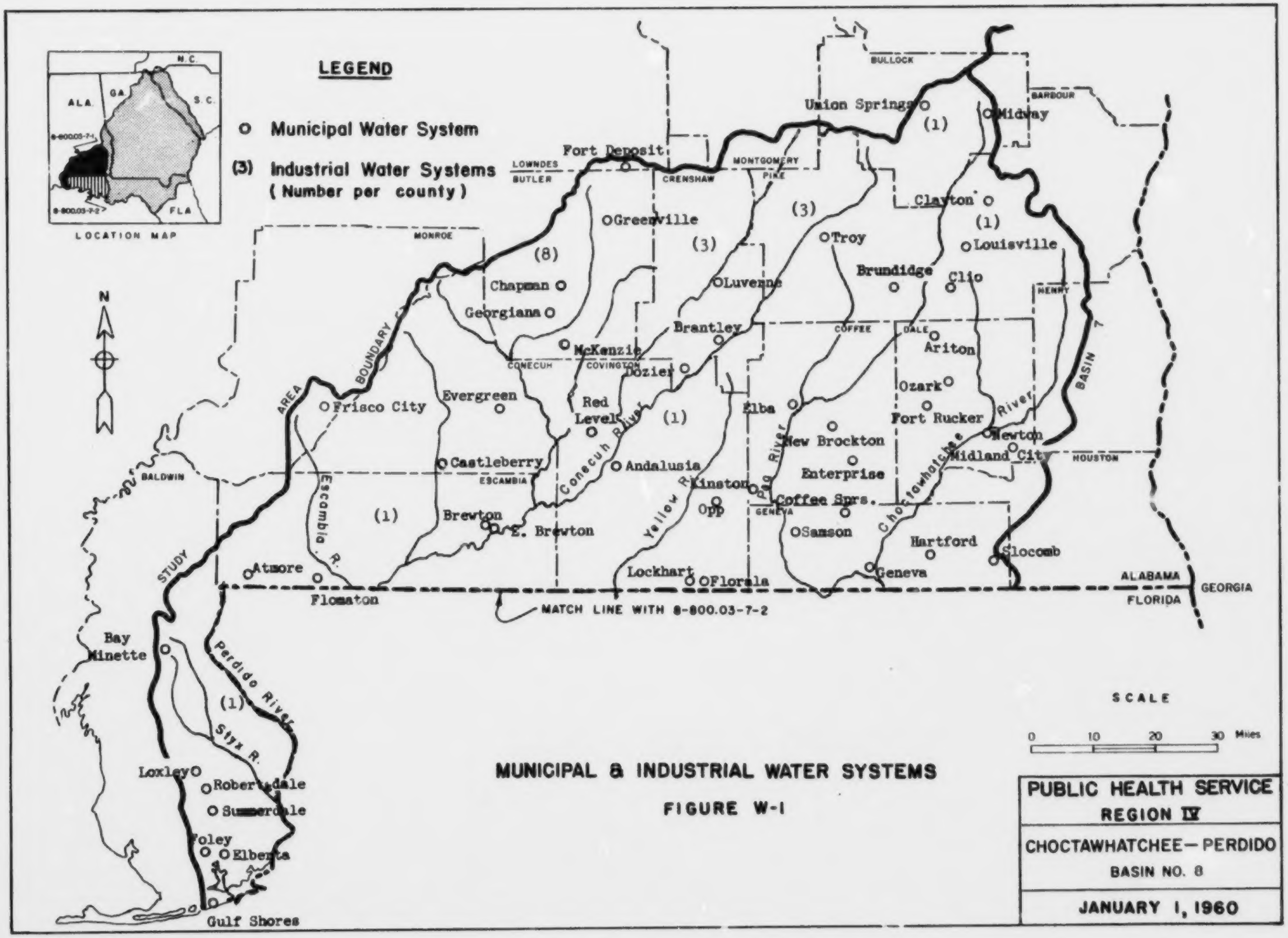
Wildlife resources in the area are reported to be extensive. Aside from the recreational attractions on the Gulf Coast, most major streams are very popular for sport fishing and those near population centers for swimming. Lake Tholocco near Ozark, Alabama is a major recreational area.

(6/15/62)

W-1

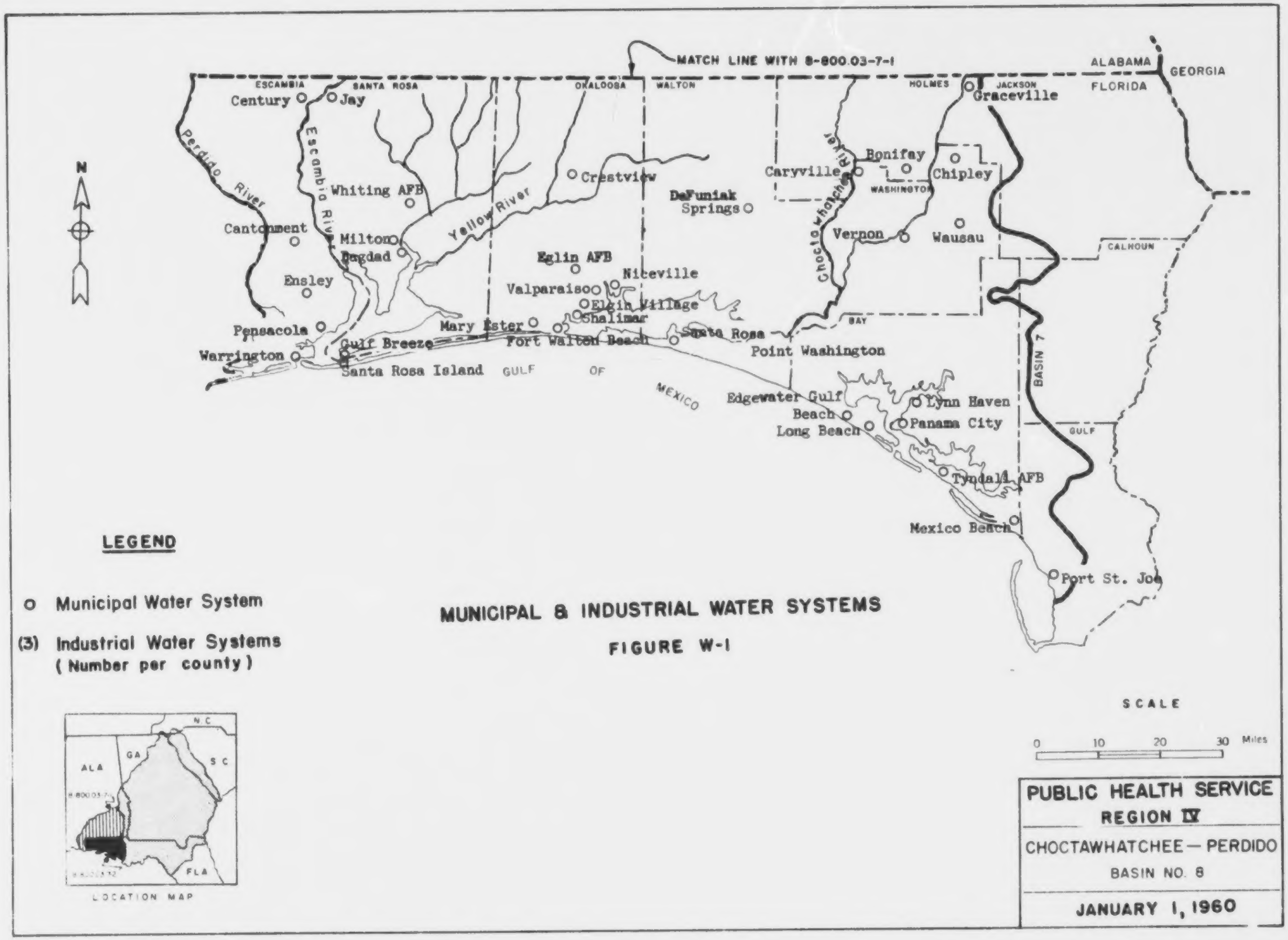
MUNICIPAL, INDUSTRIAL AND DOMESTIC WATER SUPPLIES

W-1-a


LEGEND
○ Municipal Water System
(3) Industrial Water Systems (Number per county)
LOCATION MAP
ALA.
GA.
N.C.
S.C.
FLA
8-800.03-7-1
8-800.03-7-2
N
STUDY AREA BOUNDARY
BASIN 7
MATCH LINE WITH 8-800.03-7-2
ALABAMA
GEORGIA
FLORIDA
LOWNDES
BUTLER
CRENSHAW
MONTGOMERY
PIKE
BULLOCK
BARBOUR
MONROE
CONECUH
COVINGTON
COFFEE
DALE
HENRY
HOUSTON
GENEVA
ESCAMBIA
BALDWIN
Union Springs
Midway
Fort Deposit
Greenville
Clayton
Louisville
Troy
Brundidge
Clio
Luverne
Chapman
Georgiana
McKenzie
Brantley
Ariton
Dozier
Ozark
Fort Rucker
Frisco City
Evergreen
Red Level
Elba
New Brockton
Newton
Midland City
Castleberry
Andalusia
Enterprise
Kinston
Coffee Sprs.
Opp
Brewton
E. Brewton
Samson
Hartford
Atmore
Flomaton
Lockhart
Florala
Geneva
Slocomb
Bay Minette
Loxley
Robertsdale
Summerdale
Foley
Elberta
Gulf Shores
Escambia R.
Conecuh River
Yellow R.
Pea River
Choctawhatchee River
Perdido River
Styx R.
(1)
(3)
(8)
SCALE
0
10
20
30 Miles
PUBLIC HEALTH SERVICE
REGION IV
CHOCTAWHATCHEE—PERDIDO
BASIN NO. 8
JANUARY 1, 1960

MUNICIPAL & INDUSTRIAL WATER SYSTEMS

FIGURE W-1


MATCH LINE WITH 8-800.03-7-1
ALABAMA
GEORGIA
FLORIDA
ESCAMBIA
SANTA ROSA
OKALOOSA
WALTON
HOLMES
JACKSON
WASHINGTON
CALHOUN
BAY
GULF
Century
Jay
Perdido River
Escambia River
Whiting AFB
Yellow River
Crestview
DeFuniak Springs
Caryville
Choctawhatchee River
Bonifay
Chipley
Graceville
Vernon
Wausau
Cantonment
Milton
Bagdad
Eglin AFB
Niceville
Valparaiso
Elgin Village
Shalimar
Ensley
Pensacola
Mary Ester
Fort Walton Beach
Santa Rosa
Point Washington
Gulf Breeze
Warrington
Santa Rosa Island
GULF OF MEXICO
Edgewater Gulf Beach
Long Beach
Lynn Haven
Panama City
Tyndall AFB
Mexico Beach
Port St. Joe
BASIN 7
N
LEGEND
○ Municipal Water System
(3) Industrial Water Systems (Number per county)
ALA
GA
N C
S C
FLA
8-800.03-7-1
8-800.03-8-2
LOCATION MAP
SCALE
0
10
20
30
Miles

MUNICIPAL & INDUSTRIAL WATER SYSTEMS

FIGURE W-1

PUBLIC HEALTH SERVICE
REGION IV
CHOCTAWHATCHEE — PERDIDO
BASIN NO. 8
JANUARY 1, 1960

INTRODUCTION

SCOPE OF MEMORANDUM

This memorandum contains data and information concerning the present status of municipal, industrial, and domestic water supply systems whose source of water is in the Choctawhatchee-Perdido Basin. Although an attempt was made to collect data on semi-public water supplies, the amount of information available was not sufficient to warrant inclusion in this memorandum. Estimated future water requirements in the Basin for the years 1975 and 2000 are also presented, as are suggested solutions to present and anticipated future water supply inadequcies. In connection with these suggested solutions, an appraisal of the benefits to be derived and the annual costs of water are included.

This memorandum contains no data concerning water requirements of steam-electric generating stations located in the Basin.

PROCEDURES AND INVESTIGATIONS

Existing data on water demand and availability were obtained from reports, records, and correspondence of the Alabama State Department of Health, the Alabama Water Improvement Commission, the Alabama State Chamber of Commerce, the Florida State Board of Health, the Florida State Chamber of Commerce, the U.S. Department of Agriculture, and other Federal and State agencies. Where data were found to be lacking or out-dated, extensive field investigations were conducted. These field investigations were conducted by the Alabama Water Improvement Commission and the Florida State Board of Health. These data were submitted to the U.S. Study Commission and transmitted to the Public Health Service for inclusion in this memorandum. The field investigations included visits to municipalities, small communities, industries, institutions, and a limited number of domestic water users.

Data were obtained regarding the municipal water supply systems in the Basin from water plant records, plant operators and officials, and by first hand observation of plant conditions.

Data on industrial water use were obtained from the municipalities furnishing the water, or when an industrially-owned water supply system was involved, from the industry itself. Location of municipal and industrial water supply systems is shown by figure W-1.

Little information was available concerning the large number of existing domestic water supply systems. Because limited time and funds would not permit a complete inventory of all domestic water systems, a random sample survey of approximately 500 systems throughout the SERB area was made. The data thus obtained were analyzed and certain conclusions were drawn regarding the average number of persons served by each system, the percentages of the various types of wells and equipment, and the extent of improvements needed. These SERB area averages were applied to the Choctawhatchee-Perdido Basin.

BASIC ASSUMPTIONS

Populations of individual municipalities have been projected to 1975 and 2000 using census data where available or estimated populations for communities not listed in census reports. Projections were made by applying the geometric progression method based on the rate of increase over the period 1930-1960, modified by considerations of changing economic conditions. However, the population projections of urban areas (municipalities of 2500 or more) were adjusted to match projections made by the U.S. Study Commission.

For purposes of this memorandum, future municipal water demands were determined using projected urbanized area populations and estimated per capita water use. The 1975 needs were determined using a water demand of 100 gallons per capita per day (gpcd) in municipalities of under 1,000 persons and 150 gpcd in municipalities of 1,000 or more. The 2000 projections were based on a water demand of 150 gpcd in municipalities of less than 1,000 persons and 200 gpcd in municipalities of 1,000 or more.

The number of domestic (farm and rural non-farm) water users was estimated for 1960, 1975, and 2000. This number was determined by obtaining the difference between population within the Basin served from municipal systems and total population of the Basin. Future domestic water demand was estimated by using 70 gpcd in 1975 and 100 gpcd for 2000. A figure of 4.5 persons per system was used to determine the number of domestic water supply systems. All future systems were assumed to be pressurized.

Projections of industrial water system demands (for those industries receiving all or a portion of their supply from industrially-owned systems) were determined by assuming that water demands will increase or decrease in direct proportion to projected industrial growth or decline.

January 1, 1960 constant dollars were used for the purpose of estimating annual capital costs, annual operation and maintenance costs, and annual replacement costs of existing and needed water supply systems. Interest rates of 4½ percent were used for determining annual costs for municipal, domestic, and industrial water supply systems.

Water supply system costs have been estimated on the basis of cost data developed by the Public Health Service and adjusted to the January 1, 1960 Engineering New-Record Construction Cost Index for Atlanta, Georgia.

QUANTITY AND QUALITY OF WATER AVAILABLE FOR WATER SUPPLIES

SURFACE WATER

A description of the major streams in the Basin has been included in the INTRODUCTION of these memoranda. Most of the streams in the Basin reflect seasonal characteristics of runoff common to the study area; high runoff in the winter and low runoff in the summer. Many of the streams, especially those in Alabama, may have very low dry weather flows. Some streams in Florida have only slight seasonal variation in runoff because of large, well sustained yields in flow from ground water reservoirs.

The availability of surface water quality data in the Choctawhatchee-Perdido Basin was excellent especially in the Alabama portion of Basin. Data have been collected at 125 stations; 40 in the Conecuh-Escambia sub-basin, 52 in the Choctawhatchee, 22 in the Perdido, and 11 in the Yellow sub-basin. The data which are found in the report: Water Quality Basic Data-Southeast River Basin, 1961 prepared by the Public Health Service for the U.S. Study Commission shows that the waters in the upper reaches of the Conecuh-Escambia sub-basin was generally above 75 percent of saturation. In the lower reaches of this sub-basin, however, the dissolved oxygen levels steadily decreased from an average of 70 percent to 33 percent. Hardness reported in this sub-basin was generally below 50 ppm. Turbidity ranged from 10 to 65 ppm and color from 25 to 155.

The average dissolved oxygen of the waters of the main stem of the Choctawhatchee River was consistently above 75 percent of saturation. Hardness was generally below 50 ppm and turbidity ranged from 10 to 65 ppm.

Several stations in the Perdido and Yellow sub-basins showed signs of degraded water quality. Depressed levels of dissolved oxygen and high concentrations of coliform organisms were reported at a number of the stations located on tributary streams. Hardness was consistently below 50 ppm, turbidity ranged from 5 to 55 ppm, and color from 10 to 105 ppm.

Salt water intrusion from the Gulf of Mexico occurs in the Escambia River up to Brosnaham Island near Cantonment. Tidal effect has not been observed in the Perdido River at Muscogee, therefore the movement of salt water up the river from the Gulf probably does not come within several miles of Muscogee.

GROUND WATER

Ground water is abundant throughout the Basin with wells yielding upward to 3.0 mgd. All but one of the municipalities and 12 of the industries surveyed utilize ground water sources. The Lower Tertiary, Miocene-post Miocene and the principal artesian aquifers are used for ground water supplies in the Choctawhatchee-Perdido Basin. The Lower Tertiary aquifer is prevalent in the southeastern Alabama portion of the Basin, the Miocene-post Miocene in midst of the Florida panhandle and the principal artesian in the southeastern Florida portion of the Basin.

Chemical and physical analyses of ground water were available at 70 stations throughout the Basin as shown in the report: Water Quality Basic Data-Southeast River Basins. The hardness of the waters obtained from the sand aquifers in the Basin ranged from 5 to 199 ppm and iron ranged from 0.0 to 4.10 ppm. Seven stations reported iron concentrations of 0.3 ppm or greater.

The total dissolved solids of the limestone waters ranged from 95 to 688 ppm and hardness from 28 to 270 ppm. The stations reporting high dissolved solids and hardness were located along the coastal area of the Basin. Seven stations reported iron concentrations in excess of 0.3 ppm.

Generally, little treatment would be necessary for the ground waters of the Basin to comply with the chemical requirements of the Public Health Service, "Drinking Water Standards".

MUNICIPAL WATER SUPPLIES

INVENTORY

There are 111 municipal water systems whose source of water is within the Choctawhatchee-Perdido Basin. These systems serve 405,160 persons in 114 communities and institutions. All but one of the systems (Port St. Joe) use ground water as the source of municipal supplies (Table W-1).

The total population of the Choctawhatchee-Perdido Basin in 1960 was 692,500. The 111 water systems obtaining water from within the Basin serve 405,160 persons. Average water demand of the 111 municipal systems shown in Table W-1 is 49.140 mgd or 121 gpcd. Industries which depend on municipal systems for water supply consume 3.4 mgd or 7 percent of the total municipal system output.

PRESENT STATUS OF WATER SUPPLY SYSTEMS

Thirty-five of the municipal water supply systems are privately owned and 76 are publicly owned. All plants have periodic bacteriological examinations made of the water supplied to the public. Seventy systems provide chlorination, 18 aerate the water, generally for iron and sulfur reduction and 31 adjust the pH for corrosion control and reduction of redwater problems. There are 39 systems which provide no treatment, although the supplies have proven bacteriologically satis-

TABLE W-1

BASIC DATA ON MUNICIPAL WATER SUPPLY SYSTEMS

CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	1960 Population	Estimated Population Served	Source	Treatment	Design Capacity mgd	Storage mg	Average Demand mgd	Average Demand gpcd	Percent Used by Industry
ALABAMA									
Andalusia	10,263	13,000	wells	none	1.728	0.500	0.650	50	20
Ariton	687	700	wells	Dh	0.288	0.050	0.060	86	5
Atmore	8,173	8,000	wells	AmDcKp	2.000	0.320	1.000	125	10
Bay Minette	5,197	6,260	wells	AcDhKp	1.200	0.375	0.350	56	15
Brantley	1,014	1,500	wells	none	0.237	0.060	0.080	53	0
Brewton	6,309	6,800	wells	none	1.800	0.755	1.000	147	10
Brundidge	2,523	3,200	wells	none	0.720	0.250	0.250	78	10
Castleberry	669	670	wells	none	0.200	0.110	0.075	112	0
Chapman	617	600	well	none	0.720	0.050	0.255	425	50
Clayton	1,313	1,960	wells	Dh	0.220	0.060	0.120	61	10
Clio	929	800	wells	none	0.144	0.065	0.080	100	0
Coffee Springs	205	210	well	Dh	0.072	0.030	0.020	96	0
Dozier	335	390	well	none	0.288	0.060	0.030	77	0
East Brewton	2,511	3,100	well	none	0.432	0.200	0.150	48	0
Elba	4,321	4,320	wells	DcKp	0.720	0.950	0.250	58	15
Elberta	384	380	well	DhKcp	0.210	0.050	0.040	102	2
Enterprise	11,410	11,000	wells	DcKp	2.100	0.535	0.660	60	15
Evergreen	3,703	4,330	wells	Dc	1.000	0.430	0.220	51	10
Flomaton	1,454	1,450	wells	DhKcp	1.300	0.055	0.135	93	15
Florala	3,011	3,820	wells	Dh	1.300	0.250	0.300	78	5
Foley	2,889	3,600	wells	Kcp	2.000	0.060	0.300	83	10
Fort Deposit	1,466	975	wells	none	0.195	0.060	0.050	51	1
Fort Rucker	--	10,000	wells	Dh	6.100	2.825	1.230	283	--
Frisco City	1,177	1,050	wells	none	0.225	0.150	0.150	150	20
Geneva	3,840	4,520	wells	Dc	1.350	0.350	0.400	88	10
Cotton Mill Village	180	180	well	Dh	0.500	0.212	0.080	444	80
Georgiana	2,093	2,200	wells	Dh	0.576	0.050	0.200	91	10
Greenville	6,894	6,900	wells	none	1.800	0.925	0.600	87	10
Gulf Shore	356	2,500(1)	wells	AcDhKcp	0.218	0.070	0.100	40	0
Hartford	1,956	2,715	wells	none	1.000	0.315	0.350	129	10

(2/12/62)

TABLE W-1 (CONT'D)
BASIC DATA ON MUNICIPAL WATER SUPPLY SYSTEMS
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	1960 Population	Estimated Population Served	Source	Treatment	Design Capacity mgd	Storage mg	Average Demand mgd	Average Demand gpcd	Percent Used by Industry
ALABAMA - Cont'd									
Kinston	470	600	well	none	0.144	0.060	0.030	50	0
Lockhart	799	900	wells	none	0.482	0.100	0.122	135	0
Louisville	890	880	wells	none	0.144	0.060	0.080	91	0
Loxley	831	1,000	well	ADhKp	0.430	0.075	0.040	40	5
Luverne	2,238	3,400	wells	none	1.150	0.155	0.140	41	10
McKenzie	558	650	well	Dh	0.144	0.075	0.100	154	10
Midland City	854	850	wells	none	0.260	0.036	0.065	77	10
Midway	594	500	well	Dh	0.144	0.060	0.050	100	0
Napier Field (Dothan)	600	600	wells	none	2.000	0.300	0.130	217	25
New Brockton	1,093	1,100	well	none	0.144	0.075	0.070	64	0
Newton	958	1,250	well	Dh	0.360	0.075	0.060	48	10
Opp	5,535	7,300	wells	none	1.000	1.000	0.326	45	10
Ozark	9,534	9,400	wells	AtDc	1.900	0.500	0.800	85	20
Cowikee Mill Village	220	220	well	none	0.360	0.065	0.200	909	80
Pinckard	578	350	well	none	0.033	0.050	0.015	43	0
Red Level	327	380	well	DhKp	0.144	0.085	0.038	100	0
Robertsdale	1,474	2,280	wells	AmDhKp	1.000	0.200	0.115	50	5
Samson	1,932	2,200	wells	none	0.720	0.155	0.055	100	10
Slocomb	1,368	1,520	wells	none	0.570	0.050	0.144	97	5
Summerdale	533	520	well	DhKcp	0.720	0.050	0.030	58	20
Troy	10,234	12,000	wells	none	2.000	0.560	1.100	92	10
Union Springs	3,704	4,900	wells	none	2.420	0.250	0.238	49	30
FLORIDA									
Bagdad (unincorp.)	763	240	wells	none	0.108	0.085	0.020	84	0
Bonifay	2,222	2,340	wells	Dc	0.648	0.150	0.190	81	0
Cantonment (unincorp.)	2,499	1,400	wells	DcKc	0.792	--	0.250	178	0
Caryville	730	210	well	none	0.036	none	0.017	81	0
Century (unincorp.)	2,046	500	well	Dc	0.173	0.100	0.075	150	2

(2/12/62)

TABLE W-1 (CONT'D)
BASIC DATA ON MUNICIPAL WATER SUPPLY SYSTEMS
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	1960 Population	Estimated Population Served	Source	Treatment	Design Capacity mgd	Storage mg	Average Demand mgd	Average Demand gpcd	Percent Used by Industry
FLORIDA - Cont'd									
Chipley	3,159	3,510	wells	Dh	1.008	0.160	0.200	57	0
Crestview	7,467	9,470	wells	Dh	2.640	0.300	0.650	69	0
DeFuniak Springs	5,282	7,060	wells	Dh	2.088	0.415	0.600	85	0
Edgewater Gulf Beach	undet	300	wells	Dh	undet	undet	0.003	100	0
Ensley (unincorp.)	1,836	700	well	DcKp	1.440	none	0.070	100	0
Ft. Walton Beach	12,147	13,240	wells	DcKpAtSc	2.966	0.975	0.907	69	0
Eglin Air Force Base(3) (numerous water supply points in Ft. Walton Beach-Crestview Area)	undet	undet	wells	Dc	16.869	3.350	4.268	--	--
Garniers Beach S/D	1,358	1,360	wells	Dh	0.576	0.050	0.100	74	0
Graceville	2,307	2,410	wells	Dh	1.080	0.165	0.200	82	16
Gulf Breeze									
Casablanca S/D	750	750	wells	Dh	0.360	0.030	0.060	80	0
Santa Rosa Shores S/D	350	350	wells	DcKc	0.216	none	0.028	81	0
Jay	672	740	well	none	0.180	0.075	0.090	120	4
Long Beach	200	2,000(1)	wells	Dh	0.576	0.165	0.100	150	0
Lynn Haven	3,078	2,975	wells	AtScDc	1.000	0.200	0.230	83	0
Mary Esther	780	835	well	AtDh	0.432	0.140	0.080	96	0
Mexico Beach (unincorp.)	500	1,500	well	KcAtScDc	1.296	0.200	0.075	50	0
Milton	4,108	6,675	wells	Dc	2.016	0.222	0.530	80	0
Whiting Naval Air Sta.	4,800	4,800	wells	KcpDcVt	1.152	0.400	1.000	186	--
Milton East (unincorp.)	350	350	wells	Dh	0.259	0.035	0.028	80	0
Santa Villa S/D	105	105	well	none	0.079	none	0.008	76	0
Niceville	4,517	4,530	well	Dc	0.720	0.060	0.290	64	0
Okaloosa Island Authority	--	365	well	Dh	0.936	none	0.040	110	0
Panama City (5)	33,311	34,380							
Millville Plant			wells	2-AtScDc	3.448	0.400	1.500	116	2
St. Andrews Plant			wells	AmCloSoFrsKcDc	4.500	1.300	2.500		
Lark-Way Beach Homes	315	525(1)	wells	DhAo	0.120	0.030	0.030	57	0

(2/12/62)

W-9

TABLE W-1 (CONT'D)
BASIC DATA ON MUNICIPAL WATER SUPPLY SYSTEMS
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	1960 Population	Estimated Population Served	Source	Treatment	Design Capacity mgd	Storage mg	Average Demand mgd	Average Demand gpcd	Percent Used by Industry
FLORIDA - Cont'd									
Lake Drive Hts. S/D#1	165	165	well	Dh	0.144	none	0.013	79	0
Lake Drive Hts. S/D#2	133	130	well	Dh	0.144	none	0.011	83	0
Long Point S/D	67	65	well	Dh	0.173	none	0.005	75	0
Naval Mine Defense Lab.	500	500	wells	AtKcDc	1.008	0.134	0.175	350	--
Naval Ind. Reserve Shipyard	--	undet	(served by Panama City System)						
Tyndall Air Force Base (2)	1,350	1,350	wells	AmDcCalMtps SvFrs	2.880	1.010	1.600	120	--
Woodlawn S/D	410	410	well	AtScDc	0.650	0.046	0.016	39	0
Pensacola (4)	56,752	93,090	wells	DcKpAt	32.400	2.200	9.000	97	3
Avondale & Charlor S/D's	1,000	1,000	wells	DcFp	2.000	none	0.080	80	0
Ellinor Village	400	400	wells	Kcp	0.098	0.002	0.030	75	0
Monclair Utility Co.	3,850	3,850	wells	KcDc	1.800	0.250	0.310	80	0
Saufley Hts. S/D	200	200	wells	none	0.346	none	0.016	80	0
Strandview S/D	30	30	well	Kc	0.086	0.001	0.002	67	0
Corry Field (NAAS) and Mainside (NAS)	7,000	7,000	wells	KcpDcVt	12.960	10.420	4.300	615	--
Ellyson Field (NAAS)	700	700	wells	KcpDc	2.000	0.200	0.150	215	--
Saufley Field (NAAS)	100	100	wells	KcpDc	2.000	0.200	0.290	--	--
Point Washington	275	300	well	AtSo	0.030	0.001	0.008	27	0
Port St. Joe	4,217	4,220	Chipola R	CaoDcMtps SvKcp	1.008	0.385	0.280	66	18
Anderson Beach Ctgs.	221	220	wells	none	0.173	none	0.018	81	0
St. Joe Lumber Co.	193	190	wells	none	0.200	0.025	0.050	260	0
Santa Rosa	--	--							
Blue Mountain Bch. S/D	35	35	well	none	0.014	none	0.001	30	0
Santa Rosa Island	5,800	1,000	well	Dh	undet	undet	0.010	100	0
Seagrove Bch. Housing	--	150	well	none	0.072	none	0.012	81	0
Shalimar	--	--							
Longwood S/D	165	165	well	Dh	0.144	none	0.020	121	0

(2/12/62)

TABLE W-1 (CONT'D)
BASIC DATA ON MUNICIPAL WATER SUPPLY SYSTEMS
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	1960 Population	Estimated Population Served	Source	Treatment	Design Capacity mgd	Storage mg	Average Demand mgd	Average Demand gpcd	Percent Used by Industry
FLORIDA - Cont'd									
Shalimar S/D	560	560	wells	none	0.720	none	0.050	89	0
Valparaiso	5,975	2,545	wells	Dc	1.512	0.165	0.200	79	0
Vernon	624	630	well	Dh	0.065	0.030	0.050	80	0
Villatasso	--	--							
Choctaw Beach	140	140	wells	none	undet	none	0.011	79	0
Warrington (unincorp.)	16,752	22,150	wells	KpDc	3.744	1.010	2.800	127	15
Ferry Pass Hts.	240	240	wells	Kc	0.190	0.001	0.020	84	0
Wausau (unincorp.)	300	70	well	none	0.144	none	0.015	215	0
Totals		405,160					49.140	121	

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[1] Population served during tourist season.
[2] Purchase some water from Panama City.
[3] Total figures for all plants.
[4] Also serves Brownsville.
[5] Also serves Springfield.

(2/12/62)

TABLE W-2
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1960
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	Estimated Costs in $1,000				
	Source	Treatment	Storage	Dist. System	Total
ALABAMA					
Andalusia	--	8	--	153	161
Ariton	--	--	38	78	116
Atmore	--	--	--	78	78
Bay Minette	--	--	--	78	78
Brantley	12	8	25	78	123
Brewton	--	8	--	78	86
Brundidge	--	8	--	78	86
Castleberry	--	2	--	39	41
Chapman (Mill Town)	12	2	27	--	41
Clayton	12	--	48	117	177
Clio	12	2	--	3	17
Coffee Springs	12	--	--	20	32
Dozier	--	2	--	--	2
East Brewton	--	8	--	--	8
Elba	12	--	--	117	129
Elberta	12	--	--	78	90
Enterprise	--	--	--	153	153
Evergreen	--	--	--	258	258
Flomaton	--	10	70	78	158
Florala	--	--	--	78	78
Foley	--	8	132	117	257
Fort Deposit	12	35	--	30	77
Frisco City	--	8	--	6	14
Geneva	12	--	--	78	90
Georgiana	12	--	70	78	160
Greenville	--	8	--	--	8
Gulf Shores	12	2	70	195	279
Hartford	--	8	--	--	8
Kingston	--	2	--	107	109
Lockhart	--	2	--	39	41
Louisville	12	2	48	78	140
Luverne	12	8	48	78	146
McKenzie	12	--	--	78	90
Midland City	--	2	48	78	128
Midway	--	--	--	6	6
New Brockton	12	10	--	78	100

TABLE W-2 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1960
CHOCTAWHATCHEE - PERDIDO BASINS

	Estimated Costs in $1,000				
Municipality	Source	Treatment	Storage	Dist. System	Total
ALABAMA - Cont'd					
Opp	--	8	--	78	86
Ozark	--	--	--	117	117
Cowikee Mill Village	--	2	--	--	2
Pinckard	12	2	--	18	32
Red Level	--	2	--	40	42
Samson	12	--	70	180	262
Slocomb	12	8	70	78	168
Summerdale	--	--	--	39	39
Troy	--	8	132	102	242
Union Springs	--	8	272	78	358
FLORIDA					
Bagdad	--	4	--	31	35
Baker	12	2	35	60	109
Bonifay	--	--	--	24	24
Cantonment	--	--	48	60	108
Caryville	1	2	18	30	51
Century	--	--	--	90	90
Chipley	--	--	--	78	78
Crestview	--	30	--	--	30
DeFuniak Springs	--	--	53	--	53
Destin	24	16	82	300	422
Ensley	--	--	27	66	93
Fort Walton Beach	--	--	82	584	666
Gulf Breeze					
Casablanca S/D	--	2	--	--	2
Santa Rosa Shores S/D	--	--	27	--	27
Jay	18	2	--	--	20
Lynn Haven	12	4	--	59	75
Mary Esther	12	4	--	--	16
Milligan	12	4	35	45	96
Milton	--	2	--	75	77
Milton East	--	2	--	--	2
Santa Villa S/D	--	4	18	--	22
Niceville	--	--	35	--	35

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TABLE W-2 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1960
CHOCTAWHATCHEE - PERDIDO BASINS

	Estimated Costs in $1,000				
Municipality	Source	Treatment	Storage	Dist. System	Total
FLORIDA - Cont'd					
Ocean City	24	16	82	240	362
Okaloosa Co. Island Auth.	24	4	25	--	53
Panama City	36	24	272	120	452
Lake Drive Heights S/D	--	--	18	--	18
Parker	12	8	82	180	282
Pensacola	--	--	544	--	544
Avondale & Charlor S/D	--	2	35	--	37
Saufley Heights S/D	--	4	--	--	4
Point Washington	--	4	--	--	4
Port St. Joe	--	--	41	90	131
St. Joe Lumber Co.	--	2	--	--	2
Anderson Beach Cottages	--	2	--	--	2
Santa Rosa Blue Mt. Beach	--	2	--	--	2
Sea Grove Bch. House Dev.	--	2	18	--	20
Shalimar					
Shalimar S/D	--	2	35	--	37
Southport	12	2	35	60	109
Springfield	--	--	35	90	125
Valparaiso	--	2	--	204	206
Vernon	12	2	--	--	14
Villatasso Choct. S/D	--	2	--	--	2
Warrington	--	--	132	--	132
Wausau	--	2	27	15	44
Military Installations in Basin	12	267	345	--	624
Totals	439	618	3,354	5,839	10,250

* Based on January 1, 1960 constant dollars.

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TABLE W-3
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1975
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
ALABAMA						
Andalusia	14,000	2.100	20	82	60	162
Ariton	800	0.080	--	--	--	--
Atmore	11,800	1.770	--	132	240	372
Bay Minette	9,300	1.395	24	70	180	274
Brantley	1,000	0.150	--	--	--	--
Brewton	9,000	1.350	--	--	132	132
Brundidge	3,100	0.465	--	--	--	--
Castleberry	700	0.070	--	--	--	--
Chapman (Mill Town)	500	0.255	--	--	--	--
Clayton	1,800	0.180	--	--	--	--
Clio	1,000	0.150	14	--	12	26
Coffee Springs	300	0.030	--	--	--	--
Daleville	800	0.080	14	41	48	103
Dozier	300	0.030	--	--	--	--
East Brewton	3,100	0.465	20	--	--	20
Elba	6,300	0.945	22	--	120	142
Elberta	500	0.050	--	--	7	7
Enterprise	19,500	2.922	42	82	510	634

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TABLE W-3 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1975
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
ALABAMA - Cont'd						
Evergreen	5,000	0.750	--	--	42	42
Flomaton	2,200	0.330	--	--	48	48
Florala	4,000	0.600	--	--	12	12
Foley	5,400	0.810	--	--	108	108
Fort Deposit	1,600	0.240	30	41	18	89
Frisco City	1,300	0.195	--	--	12	12
Geneva	4,800	0.675	--	--	18	18
Cotton Mill Village	180	0.080	--	--	--	--
Georgiana	2,500	0.375	--	--	18	18
Greenville	8,200	1.230	--	--	18	18
Gulf Shores	500	0.250	--	--	--	--
Hartford	2,800	0.420	--	--	6	6
Kinston	700	0.070	--	--	6	6
Lockhart	750	0.115	--	--	--	--
Louisville	1,100	0.165	--	--	14	14
Loxley	1,000	0.150	--	--	--	--
Luverne	3,400	0.340	--	--	--	--
McKenzie	600	0.099	--	--	--	--

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TABLE W-3 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1975
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
ALABAMA - Cont'd						
Midland City	1,100	0.165	--	--	15	15
Midway	600	0.060	--	--	--	--
New Brockton	1,300	0.195	--	--	12	12
Newton	1,400	0.210	--	--	9	9
Opp	7,800	1.170	20	--	30	50
Ozark	13,600	2.040	20	82	252	354
Cowikee Mill Village	220	0.200	--	--	--	--
Pinckard	600	0.060	--	--	1	1
Red Level	300	0.038	--	--	--	--
Robertsdale	2,600	0.390	--	--	19	19
Samson	1,500	0.225	--	--	--	--
Slocomb	1,600	0.240	--	--	6	6
Summerdale	900	0.090	--	--	17	17
Troy	13,400	2.010	--	--	84	84
Union Springs	5,000	0.750	--	--	6	6

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TABLE W-3 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1975
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
FLORIDA						
Bagdad	1,000	0.150	16	--	15	31
Baker	1,300	0.195	--	35	18	53
Beacon Hill	600	0.060	20	27	36	83
Bonifay	2,500	0.375	--	--	12	12
Cantonment	3,900	0.695	--	48	90	138
Caryville	1,500	0.225	14	48	45	107
Century	3,500	0.525	40	48	90	178
Chipley	4,200	0.630	--	82	42	124
Crestview	10,400	1.560	--	82	60	142
DeFuniak Springs	9,000	1.350	--	132	120	252
Destin	135	0.750	--	--	--	--
Ensley	2,900	0.435	--	48	66	114
Fort Walton Beach	23,000	3.450	24	132	600	756
Graceville	3,400	0.510	--	35	60	95
Gulf Breeze	1,500	0.225	--	35	24	59
Jay	900	0.090	--	--	10	10
Long Beach Resort	2,000	0.300	8	--	--	8
Lynn Haven	5,600	0.840	--	48	156	204

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TABLE W-3 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1975
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
FLORIDA - Cont'd						
Mary Esther	1,600	0.240	--	--	48	48
Mexico Beach	675	0.150	--	--	--	--
Milligan	1,000	0.150	--	--	15	15
Milton	7,100	1.065	--	48	--	48
Niceville	6,700	1.000	20	82	132	234
Ocean City	5,400	0.810	--	--	84	84
Okaloosa Co. Island Auth.	365	0.040	--	--	--	--
Pace	675	0.068	14	27	41	82
Panama City	66,000	9.900	72	404	1980	2456
Panama City Beach (tourist only)	undet	2.250	110	202	900	1212
Parker	4,200	0.630	20	--	72	92
Pensacola	158,300	23.750	--	816	3660	4476
Point Washington	370	0.037	16	27	6	49
Port St. Joe	6,950	1.040	217	--	168	385
Santa Rosa Blue Mt. Bch.	675	0.068	14	27	38	79
Santa Rosa Island	7,800	1.170	60	90	480	630
Sea Grove Bch. House Dev.	147	0.015	--	--	--	--

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TABLE W-3 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 1975
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
FLORIDA - Cont'd						
Shalimar	850	0.085	--	35	8	43
Southport	1,300	0.195	14	27	18	59
Valparaiso	7,300	1.095	--	58	84	142
Vernon	700	0.070	14	--	1	15
Villatasso Choct. S/D	140	0.014	--	--	--	--
Warrington	23,000	3.450	--	132	60	192
Wausau	400	0.086	--	27	6	33
Military Installations in Basin	24,450	13.013	--	--	--	--
Totals	585,182	99.980	919	3,332	11,325	15,576

* Based on January 1, 1960 constant dollars.

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TABLE W-4
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
ALABAMA						
Andalusia	16,600	3.200	40	82	156	278
Ariton	1,000	0.200	--	--	12	12
Atmore	16,200	3.240	44	82	240	366
Bay Minette	12,800	2.560	20	132	216	368
Brantley	900	0.135	--	--	--	--
Brewton	12,400	2.480	40	48	204	292
Brundidge	4,300	0.860	20	--	66	86
Castleberry	750	0.112	--	--	3	3
Chapman (Mill Town)	350	0.255	--	--	--	--
Clayton	1,500	0.220	--	--	--	--
Clio	1,100	0.220	--	35	6	41
Coffee Springs	300	0.045	--	--	--	--
Daleville	1,000	0.200	--	--	12	12
Dozier	200	0.030	--	--	--	--
East Brewton	4,300	0.860	--	48	72	120
Elba	8,700	1.740	20	--	144	164
Elberta	770	0.115	--	--	15	15
Enterprise	23,900	4.775	42	202	264	508

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TABLE W-4 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
ALABAMA - Cont'd						
Evergreen	6,900	1.380	20	--	114	134
Flomaton	2,900	0.580	--	--	42	42
Florala	5,000	1.000	--	48	60	108
Foley	7,400	1.480	--	--	120	120
Fort Deposit	1,800	0.360	20	--	12	32
Frisco City	1,600	0.320	14	--	18	32
Geneva	6,200	1.360	--	48	84	132
Cotton Mill Village	180	0.080	--	--	--	--
Georgiana	3,400	0.680	20	--	54	74
Greenville	11,300	2.260	20	--	186	206
Gulf Shores	860	0.370	--	--	--	--
Hartford	3,300	0.660	--	--	--	--
Kinston	870	0.130	--	--	30	30
Lockhart	600	0.090	--	--	10	10
Louisville	1,600	0.320	20	--	--	--
Loxley	1,360	0.270	--	--	30	50
Luverne	3,400	0.510	--	--	22	22
McKenzie	680	0.112	--	--	--	--

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TABLE W-4 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
ALABAMA - Cont'd						
Midland City	1,600	0.320	20	--	30	50
Midway	520	0.078	--	--	--	--
New Brockton	1,700	0.340	22	35	24	81
Newton	2,100	0.420	20	41	42	103
Opp	10,700	2.140	20	--	180	200
Ozark	17,100	3.420	40	70	210	320
Cowikee Mill Village	220	0.200	--	--	--	--
Pinckard	640	0.096	14	--	2	16
Red Level	200	0.030	--	--	--	--
Robertsdale	3,600	0.720	--	35	60	95
Samson	1,200	0.240	--	--	--	--
Slocomb	2,200	0.440	--	--	36	36
Summerdale	2,100	0.420	--	48	72	120
Troy	16,900	3.380	40	--	210	250
Union Springs	6,800	1.360	--	--	108	108

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TABLE W-4 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
FLORIDA						
Bagdad	1,700	0.340	22	27	42	91
Baker	2,100	0.420	20	35	48	103
Beacon Hill	1,000	0.200	--	35	24	59
Bonifay	3,000	0.600	--	35	30	65
Cantonment	7,400	1.480	22	90	210	322
Caryville	3,100	0.620	20	48	96	164
Century	8,700	1.740	20	132	312	464
Chipley	6,400	1.280	20	48	132	200
Crestview	29,800	5.960	66	354	1,200	1,620
Defuniak Springs	18,000	3.600	40	272	540	852
Destin	220	1.000	--	35	--	35
Ensley	5,400	1.080	--	82	150	232
Fort Walton Beach	77,000	15.400	360	816	3,240	4,416
Graceville	8,400	1.680	40	132	300	472
Gulf Breeze	2,400	0.480	--	35	54	89
Jay	1,500	0.300	22	27	36	85
Long Beach Resort	2,000	0.400	--	--	--	--
Lynn Haven	15,800	3.160	96	202	612	912

(2/12/62)

TABLE W-4 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000 Source and Treatment	Storage	Dist. System	Total
FLORIDA - Cont'd						
Mary Esther	3,500	0.700	24	48	114	186
Mexico Beach	1,100	0.300	--	--	--	--
Milligan	1,650	0.330	22	35	39	96
Milton	17,500	3.500	44	202	624	870
Molino	900	0.135	18	35	54	107
Niceville	13,500	2.700	40	132	408	580
Ocean City	8,800	1.760	40	90	204	334
Okaloosa Co. Island Auth.	365	0.055	--	--	--	--
Pace	1,100	0.220	14	35	26	75
Panama City	124,600	24.920	2,400	1,350	3,516	7,266
Panama City Beach (Tourist only)	Undet	3.750	66	132	600	798
Parker	7,900	1.580	40	82	222	344
Pensacola	313,000	62.300	344	1,360	9,300	11,004
Point Washington	600	0.090	--	--	12	12
Port St. Joe	12,500	2.500	218	132	330	680
Santa Rosa Blue Mt. Beach	1,100	0.220	14	35	26	75
Santa Rosa Island	9,500	1.900	20	90	90	200

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TABLE W-4 (CONT'D)
MUNICIPAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* FOR 2000
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	Estimated Population Served	Estimated Water Demand mgd	Estimated Costs in $1,000			
			Source and Treatment	Storage	Dist. System	Total
FLORIDA - Cont'd						
Sea Grove Beach House Dev.	147	0.022	--	--	--	--
Shalimar	1,000	0.200	--	27	9	36
South Flomaton	830	0.124	20	35	50	105
Southport	2,200	0.440	20	41	54	115
Valparaiso	9,000	1.800	20	90	102	212
Vernon	850	0.128	--	27	7	34
Villatasso Choct. S/D	140	0.021	--	--	--	--
Warrington	37,000	7.400	110	272	840	1,222
Wausau	660	0.142	--	--	16	16
Military Installations in Basin	24,450	13.013	--	--	--	--
Totals	1,021,812	213.053	4,738	7,609	26,840	39,187

* Based on January 1, 1960 constant dollars.

factory up to the present time without disinfection. Port St. Joe treats the surface water in a conventional treatment plant. Two of the municipalities soften their supplies and two provide flouridation.

None of the municipalities in the Basin reported any difficult treatment problems. Undoubtedly treatment problems exist, but they were not considered severe enough to report.

WATER SUPPLY SYSTEM REQUIREMENTS FOR 1960

A study of the basic data indicates that 91 of the water supply systems have source, treatment, storage, or distribution system inadequacies.

The recommended improvements as shown by Table W-2, in terms of cost, include wells, pumping facilities and expanded plant capacity at 32, storage facilities at 36, new or additional distribution mains at 63, and treatment facilities at 53 communities.

FUTURE WATER SUPPLY SYSTEM REQUIREMENTS

Table W-3 shows the projected municipal water demands for 1975. It is anticipated that most subdivisions shown in the 1960 inventory will have been incorporated into adjacent cities by 1975. The 94 municipal water systems in the Basin will have an estimated total water demand of 99.98 mgd and will serve an estimated 585,182 persons. Water supply system improvements in addition to those listed as being needed in 1960 will be required to adequately serve this population. A study of the basic data indicates that surface source facilities will be required in 1 municipality, wells in 23, disinfection equipment in 24, treatment plant construction (new or additions to existing facilities) in 5, elevated storage in 34, and expansion of distribution systems to serve an estimated 188,750 persons in 67 communities.

Table W-4 shows the projected municipal water demands for the year 2000. By the year 2000 the 96 municipal water systems in the Basin will serve an estimated population of 1,021,800 persons. The total water demand for this population is estimated to be 213.05 mgd. Basic data studies indicate that improvements in addition to those listed as being needed in 1975 will be required in 1 surface source facility, wells will be required in 47, disinfection equipment in 49, new treatment plant construction or addition in 12, elevated storage in 51, and expansion of distribution systems to serve an estimated population of 447,333 in 76 communities.

FUTURE WATER SUPPLY PROBLEMS

There appears to be ample water in the Choctawhatchee-Perdido Basins for present and anticipated future needs. However, there are a few areas where not enough water is available near points of use and it will have to be transported by pipe line or canal if the estimated growth pattern develops. The existing draft on the ground water in the Pensacola area has already created the problem of salt water intrusion. Further demands on these aquifers would intensify the problem. The problem can be solved if industry, the heaviest user, can use brackish water for cooling purposes, and reserve the ground water for municipal use and those industrial uses that require good quality water. The problem could also be solved by bringing in fresh water from upstream areas of the Perdido or Escambia Rivers. A similar solution may be needed in the Panama City area with water being transported from the Choctawhatchee River. In other portions of the basin water is available near points of use and no special impoundments or transportation facilities will be required to supplement sources of supply.

ANNUAL COSTS

The annual cost of providing water to municipal users in the Choctawhatchee-Perdido Basin in 1960 is estimated to be $3,485,000. This cost, based on the cost of existing facilities, is broken down as follows:

Annual equivalent capital cost	$ 985,200
Annual replacement cost	140,700
Annual operation and maintenance cost	2,360,000
Total annual cost (1960)	$3,485,900

The total capital outlay required to improve the existing municipal water supply facilities in 1960 is estimated to be $10,250,000 as shown in Table W-2. The expenditure of this amount of money will strengthen the existing municipal water systems of the Basin and provide adequate service.

Between 1960 and 1975, additional expenditure will be necessary to improve water supply systems and meet the demands of the increased number of users. The capital cost of providing the additional necessary improvements by 1975 is estimated to be $15,576,000 as shown in Table W-3. This includes $919,000 for improvement of sources and treatment, $3,332,000 for storage facilities, and $11,325,000 for distribution facilities.

The annual cost of providing water to municipal users by 1975 is estimated to be $7,120,900. This includes annual equivalent capital cost of: (1) existing facilities in 1960, (2) facilities recommended to meet 1960 needs, and (3) facilities recommended to meet additional needs between 1960 and 1975. The replacement cost is based on total investment as of 1975, and the operation and maintenance cost is based on the total installed systems in 1975. A breakdown of this annual cost is given below:

Annual equivalent capital cost	$2,239,300
Annual replacement cost	177,600
Annual operation and maintenance cost	4,120,900
Total annual cost (1975)	$7,120,900

Between 1975 and 2000, municipal growth will make necessary an additional estimated capital expenditure of $39,187,000 to raise the water supply facilities to the necessary capacity. This includes $4,738,000 for source improvement and treatment facilities, $7,609,000 for storage capacity, and $26,840,000 for extension of distribution facilities.

The annual cost of providing water to municipal users by 2000 is estimated to be $14,491,500 assuming that all needs have been met by the year 2000. A breakdown of this annual cost is given below:

Annual equivalent capital cost	$ 4,142,000
Annual replacement cost	237,300
Annual operation and maintenance cost	10,112,000
Total annual cost (2000)	$14,491,500

BENEFITS

Storage for municipal water supply is frequently one of the purposes served by the development of multi-purpose river basin projects. The cost of developing alternative sources of water supplies most likely to be used in the absence of the project normally provides a measure of the benefits to water supply storage. For most areas of the Basin it may be assumed that water supplies necessary to meet the demands could be obtained from ground water. Where sufficient ground water is not available other alternative sources of surface water have been used in this memorandum.

Because there is no established market value for water, as a commodity sold in a competitive market, monetary benefits from water supplies now used or anticipated to be used in the future, publicly or privately, in the Basin, are indeterminate. In common practice, the value of water supplies for which no market values are clearly established are estimated from the cost of providing supplies by the least costly, most likely means. Therefore, the benefits are assumed to be equal to the cost of obtaining water by the least costly alternative means. In this memorandum, benefits from water supply storage specifically for municipal use included in any multi-purpose project constructed in the Basin would not exceed the cost of developing alternative sources.

DOMESTIC WATER SUPPLIES

INVENTORY

The methods for obtaining basic data on domestic water supply systems have been outlined previously in the PROCEDURES AND INVESTIGATIONS section of this memorandum.

The estimated 1960 population in the Basin served by existing municipal water supply systems is 405,200. The remainder of the Basin population of 287,300 persons is served by domestic water supply systems. Average per capita water demand is 50 gallons per day which indicated a total existing domestic water demand of 14.4 mgd.

PRESENT STATUS OF WATER SUPPLY SYSTEMS

Based on the analysis of the SERB area wide random-sample survey of domestic supplies, it is estimated that there are 63,800 domestic supply systems in the Choctawhatchee-Perdido Basin. Of this total, 22,100 systems are drilled wells, 30,800 are dug wells, 3,300 bored wells, 4,100 driven wells, and 3,500 are springs.

It is estimated that 20,220 systems have an insufficient source of supply and another 20,200 have sources which do not meet accepted health standards. There are 45,600 supplies which have pressure systems and of the remaining 18,200 supplies, 3,100 use hand pumps and 15,100 use buckets. There are 25,500 systems which do not meet accepted health standards and 23,700 systems have water quality problems, the most significant of which are hardness and high iron concentrations.

WATER SUPPLY SYSTEMS REQUIREMENTS FOR 1960

In order to provide a safe, potable supply of water for human consumption, certain minimum improvements will be needed for many of the existing domestic systems. These improvements consist of development of new sources for those systems which have either insufficient sources or sources which do not meet health standards. Systems which presently use hand pumps or buckets will need to install pressure systems and those systems which do not meet health standards because of improper construction will need seals and covers. Softening or other treatment of those sources which have water quality problems is also needed.

Total capital outlay to raise existing domestic water supply systems to accepted health standards is estimated to be $28,628,800. This includes $11,725,400 for development of new sources, $1,423,000 for sanitary seals and covers, $8,211,500 for pressure systems, $5,079,600 for treatment facilities, and $2,189,300 for complete new systems.

FUTURE WATER SYSTEM REQUIREMENTS

In determining future requirements it was assumed that all domestic water supply systems in the future will be pressurized and will meet accepted health standards. By 1975, it is estimated that a total of 73,300 domestic systems serving 329,900 people will be in existence in the Choctawhatchee-Perdido Basin. This will require construction of 12,100 complete, new systems (wells, seals and covers, pressurization) and treatment for about 27 percent of the systems. Total cost of the new systems is estimated to be $12,212,800 based on 1960 constant dollars. This cost includes $11,428,000 for wells, seals and covers, and pressure systems and $784,800 for treatment facilities.

By 2000, an estimated 495,900 persons will be served by a total of 110,200 domestic water supply systems. This will require construction of 47,100 new systems (wells, seals and covers, pressurization) and treatment for about 27 percent of the systems. Total cost of the new systems is estimated to be $47,437,400 based on 1960 constant dollars. This cost includes $44,385,800 for wells, seals and covers, and pressure systems and $3,048,600 for treatment facilities.

Average domestic water demand by 1975 will be 23.1 mgd, based on 70 gpcd and in 2000 it will be 49.6 mgd based on 100 gpcd.

ANNUAL COSTS

For the purposes of this memorandum it is assumed that present and future needs of the farm and rural non-farm domestic water systems will be met on an individual basis.

The annual cost of providing domestic water from existing systems is estimated to be $4,523,600. Based on an estimated total capital investment of $51,042,200, the breakdown of annual costs is as follows:

Annual equivalent capital cost	$2,478,600
Annual replacement cost	871,000
Annual operation and maintenance cost	1,174,000
Total annual cost (1960)	$4,523,600

The annual cost of providing water for farm and rural non-farm water supply systems in 1975 is estimated to be $7,236,100 based on an estimated total investment of $87,135,700. The breakdown of total annual cost by 1975 is as follows:

Annual equivalent capital cost	$4,231,300
Annual replacement cost	1,000,700
Annual operation and maintenance cost	2,004,100
Total annual cost (1975)	$7,236,100

The annual cost of providing water from the domestic systems expected to exist in 2000 is estimated to be $11,134,600. The breakdown of annual costs for the year 2000 is as follows:

Annual equivalent capital cost	$ 6,534,900
Annual replacement cost	1,504,500
Annual operation and maintenance cost	3,095,200
Total annual cost (2000)	$11,134,600

INDUSTRIAL WATER SUPPLIES

INVENTORY

Data secured by field surveys of 32 industrially-owned water systems are shown in Table W-5. Only those industries with their own source of water were surveyed, although 5 of the industries shown in Table W-5 supplement their supplies with water from municipal water systems. The 32 industries surveyed use 239.59 mgd from their own sources, and the total amount of water supplied to all industries by municipal systems is 3.4 mgd as shown in the MUNICIPAL WATER SUPPLIES section of this memorandum. Thus, the total industrial water use in the Basin is approximately 242.99 mgd. The pulp and paper industry is the largest user of water. Although only 3 industries surveyed were pulp and paper plants, they use 125.99 mgd or 52 percent of the total water demand.

PRESENT STATUS OF WATER SUPPLY SYSTEMS

Eighteen of the industries surveyed obtain water (not including that from municipal systems) from surface sources only, 12 obtain water from wells only, and 2 obtain water from both wells and surface sources. The total use from wells is 69.9 mgd and the total use from surface sources is 169.87 mgd. No industry reported that the existing source of water was inadequate to meet demands.

Two of the industries provide disinfection and corrosion control, 2 provide disinfection and aeration and 1 softens the water for drinking and sanitation. Nine industries reported treatment of water used for processing and boiler use. Process and boiler water was softened at 4 of the plants, 2 plants used complete treatment, and 3 treated for corrosion control. Two plants disinfected water used for processing. Seven plants reported treating water for cooling. One plant used complete treatment for cooling water, 1 softened, 2 treated for corrosion control, and 3 used disinfection.

No attempt was made to determine total consumptive water use.

FUTURE WATER SUPPLY REQUIREMENTS FOR 1975 AND 2000

Industrial water use by 1975 and the year 2000 is estimated to be 385.90 mgd and 768.98 mgd respectively. Table W-6 gives the projected water demands and water system needs (in terms of cost) for 1975 and 2000.

By 1975 industrial water supply system needs for existing and new plants will include installation of 26 wells, 5 surface water intakes, 7 chlorinators, 2 storage facilities and 4 treatment plant enlargements.

Industrial development will have expanded by 2000 to the point that water supply system needs will include provision of 6 new wells, 5 intake enlargements, 2 storage facilities, 3 chlorinators and 4 treatment plant enlargements.

FUTURE WATER SUPPLY PROBLEMS

No significant industrial water supply problems, from the standpoint of quantity and quality, are expected in the future. The major portion of water supplied to industry is obtained from municipal systems and this trend is expected to continue into the future.

ANNUAL COSTS

The additional capital outlay required by industrially-owned water supply systems in the Basin for the period 1960 to 1975 is estimated to be $7,759,000 and from 1975 to 2000 is $18,840,000.

Existing industrial water supply systems are reported to be adequate for 1960 needs. The annual cost of providing industrial water in 1960 from existing supplies is estimated to be $6,717,700. A breakdown of this cost, based on the cost of existing facilities, is given below:

Annual equivalent capital cost	$ 991,700
Annual replacement cost	180,000
Annual operation and maintenance cost	5,546,000
Total annual cost (1960)	$6,717,700

Between 1960 and 1975 additional capital outlay will be required to meet increased demands of industry. The capital cost of the required improvements is estimated to be $7,759,000 as shown in Table W-6.

The annual cost of providing the industrial water required by 1975 is estimated to be $10,597,700. This includes annual equivalent capital costs of existing facilities in 1960, and facilities recommended to meet additional needs between 1960 and 1975. The replacement cost is based on the total investment as of 1975, and the operation and maintenance cost is based on the total installed systems as of 1975. A breakdown of these costs is given below:

Annual equivalent capital cost	$1,368,500
Annual replacement cost	262,200
Annual operation and maintenance cost	8,967,000
Total annual cost (1975)	$10,597,700

Between 1975 and 2000 industrial growth will make necessary an additional capital outlay of $18,840,000 to meet the increased water demand as shown in Table W-6.

The annual cost of providing the industrial water needed by 2000 is estimated to be $22,095,600, assuming that all the needs have been met by the year 2000. A breakdown of this cost is given below:

Annual equivalent capital cost	$ 2,283,300
Annual replacement cost	370,800
Annual operation and maintenance cost	19,441,500
Total annual cost (2000)	$22,095,600

BENEFITS

Storage for industrial water supply is frequently one of the purposes served by the development of multi-purpose river basin projects. The cost of developing alternative sources of water supplies most likely to be used in the absence of the project normally provides a measure of the benefits to water supply storage. For most areas of the Basin it may be assumed that water supplies necessary to meet the demands could be obrained from ground water. Where sufficient ground water is not available other alternative sources of surface water have been used in this memorandum.

Because there is no established market value for water, as a commodity sold in a competitive market, monetary benefits from water supplies now used or anticipated to be used in the future, publicly or privately, in the Basin, are indeterminate. In common practice, the value of water supplies for which no market values are clearly established are estimated from the cost of providing supplies by the least costly, most likely means. Therefore, the benefits are assumed to be equal to the cost of obtaining water by the least costly alternative means. In this memorandum, benefits from water supply storage specifically for industrial use included in any multi-purpose project constructed in the Basin would not exceed the cost of developing alternative sources.

SUMMARY

1960

The total average water demand of existing (1960) municipal, domestic, and industrial water systems whose source is within the Choctawhatchee-Perdido Basin is estimated to be 306.5 mgd. There are 111 municipal water systems (serving 405,160 persons), approximately 63,800 domestic water systems (serving 287,300 persons), and 32 industrially-owned water systems. The total annual cost of obtaining water for the municipal, domestic, and industrial systems is estimated to be $14,727,200.

TABLE W-5
BASIC DATA ON INDUSTRIAL WATER SUPPLY SYSTEMS
CHOCTAWHATCHEE - PERDIDO BASINS

Location by State and County	Code	Type of Industry	Number of Employees	Drinking and Sanitation			Processing and Boiler			Cooling			Total Plant Demand mgd
				Source	Treatment	Average mgd	Source	Treatment	Average mgd	Source	Treatment	Average mgd	
ALABAMA													
Baldwin	B	chemical	128	city	none	--	well	none	0.100	well	none	2.000	2.100
Barbour	P	iron mine	20	--	--	--	stream	none	3.600	--	--	--	3.600
Bullock	S	textile	undet	well	none	*	well	none	*	--	--	--	0.030
Butler	G	iron mine	15	--	--	--	stream	none	1.400	--	--	--	1.400
	H	iron mine	15	--	--	--	stream	none	1.000	--	--	--	1.000
	I	iron mine	15	--	--	--	stream	none	1.000	--	--	--	1.000
	J	iron mine	25	--	--	--	stream	none	2.000	--	--	--	2.000
	K	iron mine	15	--	--	--	stream	none	1.400	--	--	--	1.400
	L	iron mine	15	--	--	--	stream	none	1.400	--	--	--	1.400
	M	iron mine	20	--	--	--	stream	none	1.000	--	--	--	1.000
	N	iron mine	20	--	--	--	stream	none	0.700	--	--	--	0.700
Covington	A	naval stores	110	well	none	0.144	well	corrosion control	0.360	well	corrosion control	0.360	0.864
Crenshaw	E	iron mine	15	--	--	--	stream	none	1.400	--	--	--	1.400
	F	iron mine	15	--	--	--	stream	none	1.400	--	--	--	1.400
Escambia	D	pulp and paper	357	well	none	0.288	Conecuh R	chlor & filtration	23.100	Conecuh R	chlor & filtration	0.900	24.288
Pike	O	iron mine	15	--	--	--	stream	none	1.400	--	--	--	1.400
	Q	iron mine	20	--	--	--	stream	none	1.400	--	--	--	1.400
	R	iron mine	15	--	--	--	stream	none	2.000	--	--	--	2.000
	C	iron mine	15	--	--	--	stream	none	1.000	--	--	--	1.000
FLORIDA													
Bay	A	pulp and paper	1,000	wells	none	0.015	wells and Martin L	soften	14.400	Watson Bayou	chlor	34.560	48.975
Escambia	B	chemical	75	wells	none	0.001	wells	none	0.005	wells	none	0.304	0.310
	C	synthetic fiber	350	wells	chlor & pH adj	0.005	wells	soften	0.720	wells	soften	*	0.725
	D	resins	50	wells	undet	0.001	wells	undet	0.199	--	--	--	0.200
	E	fiber tile	400	city	--	--	wells	none	0.500	wells	none	*	0.500
	F	nylon	6,000	wells	soften	1.600	wells	soften	6.400	Escambia R	chlor	44.000	52.000
	G	zirconium	175	well	soften	0.003	well	soften	0.720	well	soften	0.360	1.083
	H	chemical	260	wells	aerate,chlor	0.002	wells	aerate,chlr pH adj	0.650	wells	aerate, chlor	3.670	4.322
	I	naval stores	500	well	undet	0.008	wells	undet	2.500	--	--	--	2.508
	J	pulp and paper	1,987	wells	chlor.,&pH	0.030	wells	none	32.000	wells	none	*	32.030
Gulf	K	chemical	42	city	--	--	wells	chlor.,& pH	0.072	wells	chlor & pH adj	*	0.072
	M	pulp and paper	800	city	--	--	Chipola R	--	--	St.Joseph Bay	none	12.000	12.000
													205.620

(2/12/62)

* Breakdown of water use not available. See last column for total water demand.

W-35

TABLE W-6
INDUSTRIAL WATER SUPPLY SYSTEMS
ESTIMATED NEEDS AND COSTS* - 1975 AND 2000
CHOCTAWHATCHEE - PERDIDO BASINS

Location by State and County	Code	Estimated 1975 Requirements		Estimated 2000 Requirements	
		mgd	Costs	mgd	Costs
ALABAMA					
Baldwin	B	2.870	24,000	2.620	--
Barbour	P	5.400	2,500	8.100	5,000
Bullock	S	0.026	2,000	0.024	--
Butler	G	2.250	2,500	3.400	2,500
	H	1.600	2,500	2.420	--
	I	1.600	2,500	2.420	--
	J	3.200	2,500	4.850	5,000
	K	2.250	2,500	3.400	2,500
	L	2.250	2,500	3.400	2,500
	M	1.600	2,500	2.420	--
	N	1.100	2,500	1.700	--
Covington	A	1.180	28,000	1.060	--
Crenshaw	C	1.660	2,500	2.330	--
	E	2.340	2,500	3.550	2,500
	F	2.340	2,500	3.550	2,500
Escambia	D	39.200	2,145,500	92.000	7,600,000
Pike	O	2.340	2,500	3.270	2,500
	Q	2.100	2,500	3.150	2,500
	R	3.320	2,500	4.660	2,500
FLORIDA					
Bay	A	78.200	2,820,000	184.000	5,600,000
Escambia	B	0.520	26,000	0.750	24,000
	C	1.240	234,000	1.760	234,000
	D	0.280	--	0.260	--
	E	0.810	--	1.370	--
	F	87.500	1,890,000	125.700	2,046,000
	G	1.460	145,000	1.610	73,000
	H	7.230	36,000	10.000	36,000
	I	3.500	12,000	3.100	--
	J	53.200	188,000	124.000	2,700,000
Gulf	K	0.121	--	0.173	--
	L	1.720	6,000	2.430	2,500
	M	71.500	165,000	165.000	495,000
Totals		385.900	7,759,000	768.977	18,840,000

* Based on January 1, 1960 constant dollars.

(2/12/62)

1975

By 1975, the total average water demand of municipal, domestic, and industrial water systems whose source of water is within the Basin is estimated to be 509.0 mgd. The municipal water system will serve 585,180 persons and there will be an estimated 73,300 domestic water systems serving 329,900 persons. The total annual cost of obtaining water from municipal, domestic, and industrial systems is estimated to be $24,954,700 by 1975.

2000

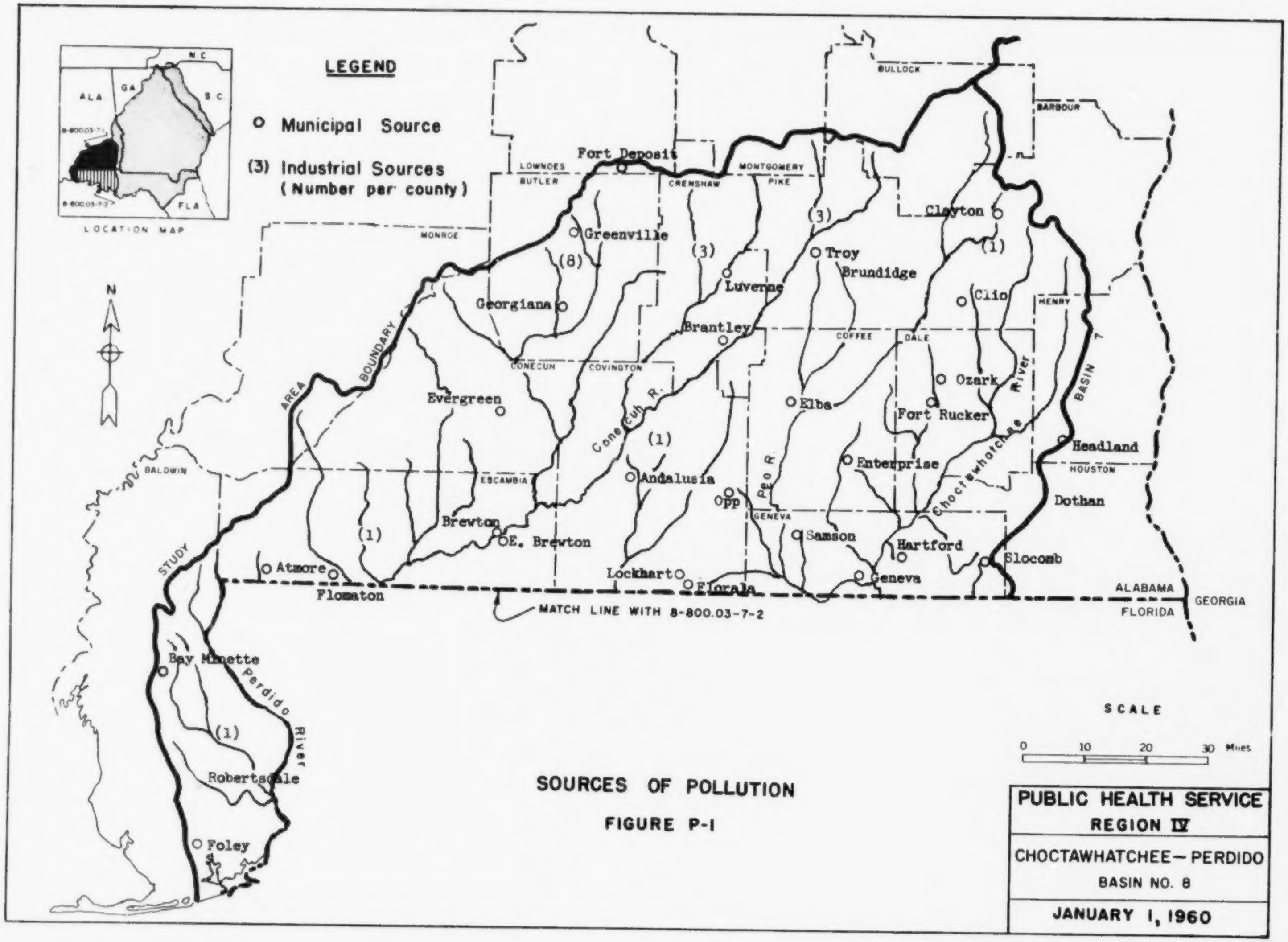
By the year 2000, the total average water demand of municipal, domestic, and industrial water systems whose source of water is within the Basin is estimated to be 1,031.6 mgd. The municipal water system will serve 1,021,800 persons and there will be an estimated 110,200 domestic water systems serving 495,900 persons. The total annual cost of providing water for municipal, domestic, and industrial water uses is estimated to be $47,721,700.

Water supply sources in the Choctawhatchee-Perdido Basin are expected to be adequate to meet demands by the year 2000 if they are properly developed. Abatement of existing and possible future water pollution problems will be needed to protect water consumers.

P-1

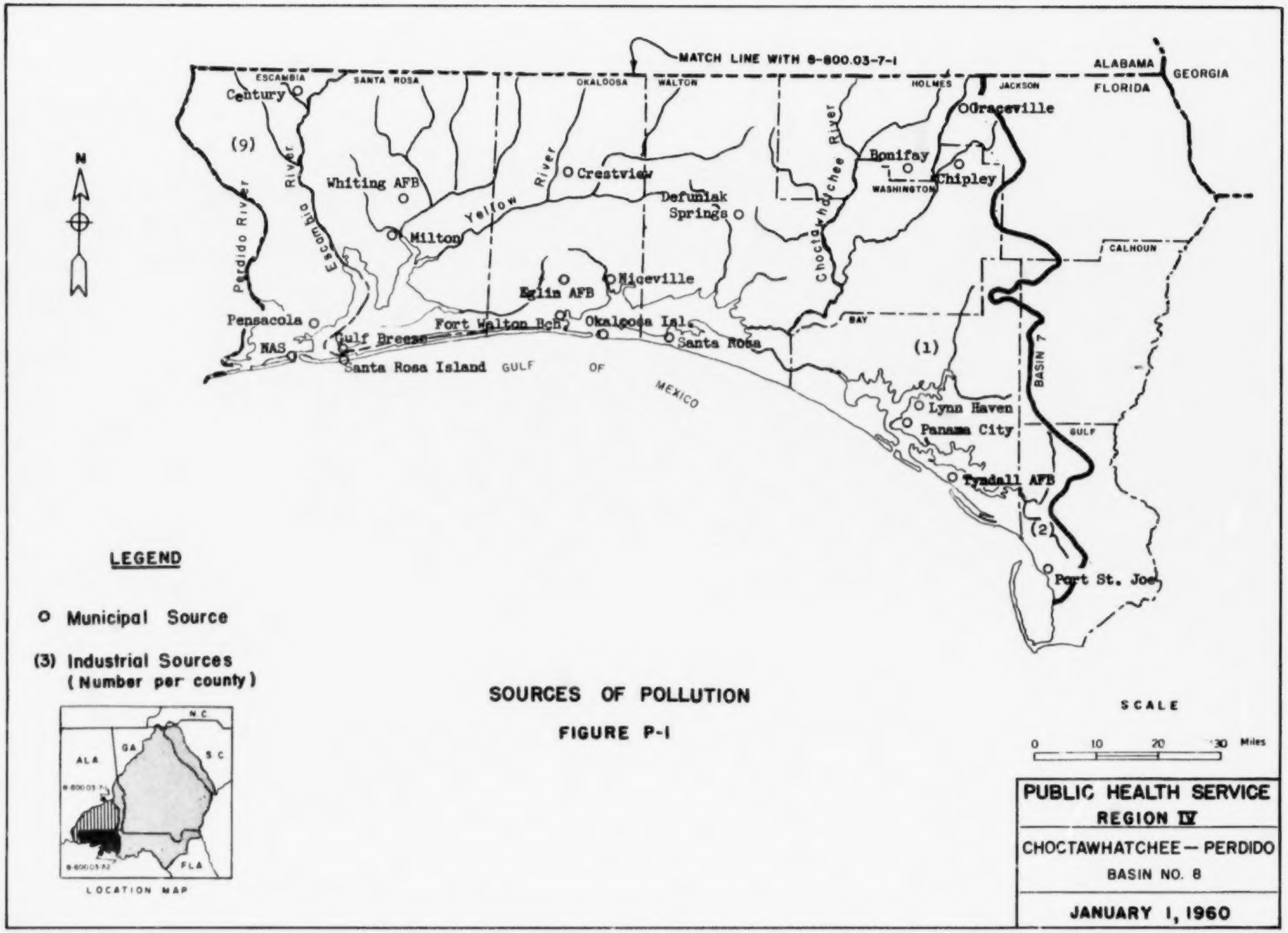
POLLUTION ABATEMENT

P-1-a


LEGEND
○ Municipal Source
(3) Industrial Sources (Number per county)
LOCATION MAP
N C
S C
ALA
GA
FLA
8-800.03-7-1
8-800.03-7-2
N
PUBLIC HEALTH SERVICE
REGION IV
CHOCTAWHATCHEE — PERDIDO
BASIN NO. 8
JANUARY 1, 1960
SCALE
0
10
20
30 Miles
MATCH LINE WITH 8-800.03-7-2
ALABAMA
FLORIDA
GEORGIA
STUDY AREA BOUNDARY
BASIN 7
LOWNDES
BUTLER
CRENSHAW
MONTGOMERY
PIKE
BULLOCK
BARBOUR
MONROE
CONECUH
COVINGTON
COFFEE
DALE
HENRY
HOUSTON
GENEVA
ESCAMBIA
BALDWIN
Fort Deposit
Greenville
(8)
Georgiana
(3)
Luverne
Brantley
(3)
Troy
Brundidge
Clayton
(1)
Clio
Ozark
Fort Rucker
Headland
Dothan
Evergreen
Conecuh R.
(1)
Andalusia
Opp
Pea R.
Elba
Enterprise
Choctawhatchee River
Samson
Hartford
Geneva
Slocomb
Brewton
E. Brewton
(1)
Atmore
Flomaton
Lockhart
Florala
Bay Minette
Perdido River
(1)
Robertsdale
Foley

SOURCES OF POLLUTION

FIGURE P-1


MATCH LINE WITH 8-800.03-7-1
ALABAMA
GEORGIA
FLORIDA
ESCAMBIA
SANTA ROSA
OKALOOSA
WALTON
HOLMES
JACKSON
WASHINGTON
CALHOUN
BAY
GULF
Century
(9)
Perdido River
Escambia River
Whiting AFB
Milton
Yellow River
Crestview
Defuniak Springs
Choctawhatchee River
Bonifay
Chipley
Graceville
Niceville
Eglin AFB
Pensacola
NAS
Gulf Breeze
Santa Rosa Island
Fort Walton Bch.
Okaloosa Isl.
Santa Rosa
GULF OF MEXICO
(1)
BASIN 7
Lynn Haven
Panama City
Tyndall AFB
(2)
Port St. Joe
N
LEGEND
○ Municipal Source
(3) Industrial Sources (Number per county)
ALA
GA
N C
S C
FLA
8-800.03-7-1
8-800.03-8-2
LOCATION MAP
SCALE
0
10
20
30
Miles

SOURCES OF POLLUTION

FIGURE P-1

PUBLIC HEALTH SERVICE
REGION IV
CHOCTAWHATCHEE — PERDIDO
BASIN NO. 8
JANUARY 1, 1960

INTRODUCTION

SCOPE OF MEMORANDUM

This memorandum contains data and information concerning the present status of municipal and industrial sewage works which discharge to the Choctawhatchee-Perdido Basin. Although located within the Basin, Union Springs discharges its waste outside the SERB area and has not been included in this memorandum. Dothan and Headland, Alabama, although located within the Basin, discharge only a portion of their wastes to the Basin and have been considered accordingly. Existing and recommended municipal waste facilities have been listed as serving individual municipalities and other political entities.

Projected future pollution abatement requirements for industries and municipalities by the year 1975 and 2000 are presented, as suggested solutions to present and anticipated future inadequacies. In connection with these solutions, an appraisal of the benefits to be derived from the proposed program and the annual costs of pollution abatement are included.

PROCEDURES AND INVESTIGATIONS

Existing data on pollution abatement in the Basin were obtained from reports, records, and correspondence of the Alabama State Department of Health, the Alabama Water Improvement Commission, the Florida State Board of Health, the U.S. Department of Agriculture and other Federal and State Agencies. Where data were found to be lacking or outdated, extensive field investigations were conducted by the Florida State Board of Health and the Alabama Water Improvement Commission. These data were submitted to the U.S. Study Commission and transmitted to the Public Health Service for inclusion in this memorandum. These field investigations included visits to municipalities, small communities, industries, and institutions.

Data were obtained regarding 68 municipal (which includes 23 sub-divisions and institutions) and 30 industrially owned sewage and waste works in the Basin. Industries connected to municipal sewer systems were not inventoried. The data were carefully studied to establish both the present and future pollution abatement requirements.

BASIC ASSUMPTIONS

Populations of individual municipalities have been projected to 1975 and 2000 using census data where available or estimated populations for those communities not listed in the census reports.

Projections were made by applying the geometric progression method based on the rate of increase over the period 1930-1960, modified by considerations of changing economic conditions. However, the population projections of urban areas (municipalities of 2500 or

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more) were adjusted to match projections made by the U.S. Study Commission-SERB.

Most existing industries are expected to increase or decrease their waste discharges in the future in proportion to the projected industrial growth or decline. For the purpose of this memorandum, it is assumed that municipalities of 800 or more should be sewered now, and municipalities of less than 800 should be sewered whenever the present methods of disposal are considered inadequate. It is also assumed that each municipality, regardless of population, now partially sewered, should extend its collection system to serve the total population.

In the administration of "Grants for Construction" under Section 6 of Public Law 660 and its amendments, the Public Health Service has established "The substantial removal of settleable solids" as the minimum acceptable treatment for projects in which the Federal Government participates. In general, the Public Health Service considers primary treatment to be the minimum acceptable degree of treatment for municipal sewage and an equivalent treatment the minimum for industrial liquid wastes. The need for additional treatment has been determined on the basis of expected dilution water available during periods of low stream flow and/or downstream water use. With the exception of the Florida portion of the Basin, stabilization ponds have been recommended for most municipalities with less than 1500 persons.

It is assumed that primary treatment plants will effect 35 percent BOD removal and secondary plants will effect 85 percent BOD removal. Tertiary treatment or a greater than 85 percent BOD removal has not been considered for purposes of reducing low flow requirements. At these higher treatment efficiencies, dilution water requirements for water quality control depend on dilution of nutrients and chemicals present in the water rather than dilution of remaining BOD. Plant nutrients and chemicals are reduced very little, if any, in conventional sewage treatment plants and must, therefore, be considered as important pollutants in sewage effluents.

Sewage works costs have been estimated on the basis of per capita cost data developed by the Public Health Service and adjusted on the basis of the January 1, 1960 Engineering News-Record Construction Cost Index for Atlanta, Georgia. Engineering, legal, and financing costs have been added on the basis of United States experience for the period July 1956-June 1959. Sewage system costs include the cost of structures, devices, equipment, and appurtenances intended for the collection and pumping of sewage. Treatment plant costs include the cost of treatment facilities and outfall lines.

Annual equivalent capital costs, annual operation and maintenance costs, and replacement costs of existing and needed pollution abatement facilities were estimated on the basis of January 1, 1960 constant dollars. Interest rates of 4¼ percent were used for determining annual costs for both industries and municipalities.

GENERAL

Water pollution may be defined as the adding to water of any substance, or the changing of water's characteristics in any way which interferes with its use for legitimate purposes. Water polluting substances may be classified according to eight general categories: (1) Sewage and other oxygen demanding wastes, (2) infectious agents, (3) plant nutrients, (4) organic chemical exotics, (5) sediments, (6) radioactive substances, (7) heat, and (8) toxic and other mineral and chemical substances.

The Nation and its communities, as well as business and private operations and individuals, incur losses or damages because of water pollution. Some of these losses or damages are reflected directly in additional costs for construction, operation and maintenance of water treatment facilities. By far the larger share of the total damages is not directly accountable. The impairment to health, the loss or dimunition of fishing and recreational uses, and depreciated property values, caused by polluted waters, have an adverse economic impact which is diffused throughout society. This is paid for through the reduction in utility of the water resources and the restriction on economic growth rather than through dollar payments for corrective devices. Unfortunately, these indirect consequences of pollution are not readily expressed in dollar terms because of their diffusiveness and because they are not recorded by direct, open-market transactions. Nevertheless, such adverse consequences are real and constitute a handicap to the fulfillment of economic and social goals.

Pollution control measures alleviate these adverse conditions and produce economic benefits associated with the improved waters. These benefits are often not apparent to the public, however, because they constitute insurance for future usefulness as well as for immediate purposes, or they may be indirect or intangible. The computation of these benefits faces the same difficulties as the computation of the total damages. That is, the dollar measurement problem has not yet been solved and a yardstick for actions or events not recorded in market transactions is lacking. Many of the benefits from pollution control are in this nonmarket realm, e.g., enhancement of fishing and recreational opportunity, protection of health, scenic improvement, and assurance of the future utility of water resources for various other purposes. The private market price system, therefore, cannot be relied upon solely or chiefly to provide the measurement. New devices for taking into account the social or public values must be devised.

INVENTORY OF POLLUTION ABATEMENT

SOURCES OF POLLUTION

The surface waters of the Basin are used for the final disposal of liquid wastes, treated and untreated, from 68 municipalities (including 23 sub-divisions and institutions), and 30 industries as shown in Tables P-1 and P-2. Municipalities and institutions discharge 27.8 mgd of sewage of which 24.0 mgd has undergone treatment of some type, and industries discharge 182.2 mgd of which 131.7 mgd has undergone treatment of some type.

A total of 263,685 persons are served by the 68 municipalities and institutions which discharge to the Choctawhatchee-Perdido Basin. The total population equivalent (PE) of the municipal sewage in the Choctawhatchee-Perdido Basin is estimated to be 271,150 before treatment and 103,855 of this total is discharged to the Basin's waters after treatment.

The industrial wastes produced in the Basin include chemical, mining, and pulp and paper wastes. The mining industry which is the most numerous industry in the Basin accounts for 15 of the 30 industries inventoried. The strength of the organic wastes from 12 industries producing this type of waste is estimated to be 849,500 PE based on BOD. The other 18 industries produce inorganic liquid wastes such as acids, alkalies, sediments, etc. The population equivalent of the industrial wastes after treatment is estimated to be 495,675.

The waters of the Basin also receive pollution from natural sources and from the agricultural use of the land. Pollution from natural sources include organic material leached from the decaying matter in the forests and swamps, and minerals dissolved from the soil and rocks. The pollution resulting from the agricultural use of the land includes organic and mineral fertilizers, insecticides, pesticides, and herbicides which are washed into the waters during heavy rains or which are inadvertently deposited into the waters during application. Drainage from livestock feed lots, dairy barns, pig pens, manure heaps, and other farm refuse also adds to the pollution load carried by the streams.

EXISTING SEWAGE TREATMENT FACILITIES

As shown in Table P-1, 32 municipalities and institutions provide secondary treatment for sewage collected from 135,240 persons (or 51 percent of the total sewered population discharging sewage to the Basin's waters). Stabilization ponds have been considered as secondary treatment plants for the purpose of this summary.

There are 11 municipalities and institutions in the Basin which provide primary treatment for the sewage collected from 87,100 persons (or 33 percent of the total sewered population discharging sewage to the Basin's waters). Panama City provides both primary and secondary treatment for its sewage.

Septic tanks are provided by 4 municipalities and institutions serving 3,260 persons (or about one percent of the total sewered population discharging sewage to the Basin's waters).

The remaining 20 municipalities and institutions which discharge sewage to the Basin's waters provide no treatment. Approximately 38,100 persons (or 15 percent of the total sewered population discharging sewage to the Basin's waters) are served by the collection systems in these municipalities.

The sewage treatment plant listed for Santa Rosa Island, Florida also serves Pensacola Beach.

As shown in Table P-2, all but two of the industries listed provide treatment of some degree to their liquid wastes. One of these, however, provides no reduction of the BOD load discharged from the plant.

Eighteen industries lagoon and 8 settle their industrial liquid wastes. One industry provides the equivalent of secondary treatment and one reclaims waste products. The remaining 2 industries provide no treatment for their wastes. All other industries in the Basin discharge liquid wastes either to septic tanks with subsurface drain fields or to municipal sewer systems. Industries disposing of liquid wastes by these methods were not inventoried and no data are available.

Soil conservation practices used in many areas of the Basin are very useful in preventing pollution resulting from agricultural use of the land. Good erosion preventative measures, practiced by the highway and railroad maintenance departments assist in the control of sediment coming from roadway embankments. There are no pollution control measures used especially for the purpose of abating pollution from natural sources.

EFFECTS ON STREAMS

The coastal waters of the Basin are relatively free from pollution except in the vicinity of Panama City and Pensacola where municipalities and industries are concentrated. Some of the meandering arms of the bays and estuaries have areas of localized pollution from sewage discharges from camps and small housing developments.

Nuisance conditions exist in the streams below the sewer outlets of Brewton, Brundidge, and Greenville in Alabama. Polluted conditions, as indicated by dark color and the presence of odor, scum and deposits, are evident below the sewer outlets of Atmore, Elba, Evergreen,

TABLE P-1
BASIC DATA ON SOURCES OF MUNICIPAL POLLUTION
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	1960 Population	Estimated Population Served	Estimated Average Flow mgd	Type of Treatment	Design Capacity PE 1,000s	Design Capacity Flow mgd	Estimated PE (BOD) Untr'd Waste	Estimated PE (BOD) Disch'd Waste	Receiving Stream
ALABAMA									
Andalusia #1	10,263	4,000	0.400	secondary	4.5	0.45	4,000	600	Bay Br-Five Runs Cr
#2		4,000	0.400	secondary	4.5	0.45	4,000	600	Conecuh R-Escambia R
Atmore	8,173	7,000	0.700	primary	4.5	0.45	7,000	5,600	Br-Brushy Cr-Perdido R
Atmore Prison	700	700	0.070	primary	1.0	0.10	700	490	Wet Weather Cr-Sizemore Cr
Bay Minette	5,197	3,000	0.300	primary	5.0	0.50	3,000	1,800	Hollinger Cr-Styx R
Brantley	1,014	900	0.090	none	--	--	900	900	Conecuh R-Escambia R
Brewton	6,309	4,000	0.400	none	--	--	4,000	4,000	Burnt Corn Cr-Murder Cr-Conecuh R
Brundidge #1	2,523	1,000	0.100	none	--	--	1,000	1,000	Mims Cr-Whitewater Cr
#2		200	0.020	none	--	--	200	200	Bear Cr-Richland Cr-Pea R
Clayton	1,313	400	0.040	none	--	--	400	400	Lindsey Cr-W Fk-Choct R
Clio	929	600	0.060	septic tank	1.0	0.10	600	420	Faulk Cr-Big Cr
Dothan (part)	--	12,000	0.750	secondary	25.0	2.50	12,000	1,500	Beaver Cr-L Choct R
Napier Field	300	300	0.030	none	--	--	300	300	Murphy Mill Cr-L Choct R
East Brewton	2,511	1,600	0.160	none	--	--	1,600	1,600	Murder Cr-Conecuh R
Elba	4,321	2,700	0.270	none	--	--	2,700	2,700	Pea R-Choct R
Enterprise #1	11,410	6,000	0.314	secondary	12.0	1.00	2,800	152	Blanket Cr-Double Bridge Cr
#2		3,000	0.210	secondary	3.5	0.35	1,800	152	Indian Camp Cr-Stripling Cr
Evergreen	3,703	2,500	0.250	none	--	--	2,500	2,500	Murder Cr-Conecuh R
Flomaton	1,454	1,200	0.120	none	--	--	1,200	1,200	Big Escambia Cr-Escambia R
Florala	3,011	2,300	0.230	none	--	--	2,300	2,300	Corner Cr-Flat Cr
Foley	2,889	1,500	0.120	primary	1.0	0.10	1,200	960	Wolf Cr-Wolf Bay
Fort Deposit	1,466	700	0.060	primary	1.0	0.10	700	420	Pigeon Cr-Conecuh R
Fort Rucker (Army)	--	10,000	0.804	secondary	20.0	2.00	10,000	500	Clay Bank Cr-Choct R
Hanchey Field	--	300	0.003	stab pond	0.7	0.07	300	45	Br-Choct R
Geneva	3,840	2,800	0.280	none	--	--	2,800	2,800	Pea R and Double Bridges Cr-Choct R
Georgiana	2,093	1,100	0.110	septic tank	1.0	0.10	1,100	880	Rocky Cr-Persimmon Cr-Sepulga R
Greenville	6,894	5,500	0.550	none	--	--	5,500	5,500	Persimmon Cr-Sepulga R

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TABLE P-1 (CONT'D)
BASIC DATA ON SOURCES OF MUNICIPAL POLLUTION
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	1960 Population	Estimated Population Served	Estimated Average Flow mgd	Type of Treatment	Design Capacity		Estimated PE (BOD)		Receiving Stream
					PE 1,000s	Flow mgd	Untr'd Waste	Disch'd Waste	
ALABAMA - Cont'd									
Hartford	1,956	1,450	0.140	none	--	--	1,450	1,450	Mill Cr-Hurricane Cr
Headland (part)	--	1,000	0.100	none	--	--	1,000	1,000	Blackwood Cr-Choct R
Lockhart	799	450	0.045	none	--	--	450	450	Town Br-Yellow R
Luverne	2,238	2,000	0.200	none	--	--	2,000	2,000	Patsaliga Cr-Conecuh R
Opp	5,535	4,500	0.450	none	--	--	4,500	4,500	Lightwood Knot Cr-Yellow R
Ozark	9,534	7,000	0.454	secondary	10.0	1.00	3,255	102	Hurricane Cr-Choct R
Robertsdale	1,474	900	0.125	secondary	2.5	0.25	900	20	Blackwater R -Perdido Bay
Samson	1,932	1,400	0.140	none	--	--	1,400	1,400	Boyenton Cr and Sandy Cr-Pea R
Slocomb	1,368	600	0.050	none	--	--	600	600	Hurricane Cr-Choct R
Troy #1	10,234	4,000	0.350	secondary	6.0	0.60	2,200	150	Double Br-Conecuh R
#2		4,000	0.300	secondary	6.0	0.60	2,200	150	Walnut Cr-Whitewater Cr-Choct R
FLORIDA									
Bonifay	2,222	1,260	0.082	septic tank	undet	undet	1,260	1,000	Ditch-Holmes Cr-Choct R
Century	2,046	1,300	0.130	none	--	--	1,300	1,300	Escambia R
Chipley	3,159	2,500	0.250	primary	3.0	0.30	2,500	1,000	Alligator Cr-Holmes Cr
Crestview	7,467	5,775	0.400	secondary	6.0	0.60	5,775	700	Juniper Cr-Shoal R-Yellow R
DeFuniak Springs	5,282	3,870	0.264	secondary	4.8	0.48	3,870	600	Bruce Cr-Choct R
Eglin AFB	--	undet	0.873	secondary	10.0	1.00	undet	undet	Choctawhatchee Bay
Field #9	--	undet	0.387	secondary	5.0	0.50	undet	undet	Santa Rosa Sound
Eglin Village	6,000	6,000	0.300	secondary	10.0	1.00	6,000	1,200	Ditch-Choct Bay
Fort Walton Beach	12,147	11,011	1.500	secondary	10.0	1.00	11,000	800	Santa Rosa Sound
Graceville	2,307	2,000	0.200	secondary	2.5	0.25	2,000	200	Little Cr-Holmes Cr-Choct R
Gulf Breeze									
Casablanca S/D	750	200	0.014	primary	undet	undet	200	125	Santa Rosa Sound
Santa Rosa S/D	350	210	0.015	secondary	undet	undet	210	100	Santa Rosa Sound

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TABLE P-1 (CONT'D)
BASIC DATA ON SOURCES OF MUNICIPAL POLLUTION

Municipality	1960 Population	Estimated Population Served	Estimated Average Flow mgd	Type of Treatment	Design Capacity		Estimated PE (BOD)		Receiving Stream
					PE 1,000s	Flow mgd	Untr'd Waste	Disch'd Waste	
FLORIDA - Cont'd									
Lynn Haven	3,078	300	0.020	septic tank	0.2	0.02	300	250	North Bay-St. Andrews Bay
Mary Esther									
Springdale S/D	--	35	0.003	secondary	0.4	0.04	35	5	Ditch-Santa Rosa Sound
Milton	4,108	4,550	0.400	secondary	6.0	0.60	4,550	1,000	Blackwater R-Blackwater Bay
Santa Villa S/D	105	140	0.014	stab pond	0.1	0.02	140	100	Creek-Escambia Bay
Whiting Field NAS	--	4,800	0.636	secondary	7.0	0.70	4,800	90	Clear Cr-Blackwater R
Niceville	4,517	3,645	0.110	secondary	5.0	0.50	3,645	600	Valparaiso Bay
Okaloosa Is. Auth.	--	200	0.020	secondary	2.0	0.20	200	75	Santa Rosa Sound
Panama City #1	33,311	16,500	1.600	secondary	30.0	3.00	16,500	1,700	Watson Bay-St. Andrews Bay
#2		10,000	1.000	primary	20.0	2.00	10,000	6,000	St. Andrews Bay
Woodlawn S/D	410	350	0.030	primary	1.1	0.11	350	175	North Bay-St. Andrews Bay
Navy Mine Lab	--	500	0.129	secondary	3.0	0.30	500	25	St. Andrews Bay
Tyndal AFB	--	undet	1.100	secondary	11.5	1.15	14,600	950	Gulf of Mexico
Pensacola #1	56,752	32,400	3.391	primary	28.8	2.88	32,400	19,440	Pensacola Bay
#2		17,600	1.813	primary	26.4	2.64	17,600	10,600	Pensacola Bay
Mayfair S/D	1,400	1,400	0.140	secondary	1.4	0.18	1,400	70	Bayou Marcus Cr-Perdido Bay
Montclair S/D	3,850	3,850	0.263	secondary	3.5	0.35	2,850	193	Bayou Marcus Cr-Perdido Bay
Morena Ct S/D	2,800	2,800	0.130	secondary	2.1	0.21	2,800	84	Ditch-Bayou Chico
Pen Haven S/D	5,250	5,250	0.415	secondary	3.0	0.30	9,156	252	Ditch-Bayou Chico
Corry Field AFB	--	200	0.020	secondary	2.1	0.21	200	10	Br-Bayou Chico
Ellyson Field NAS	--	700	0.109	secondary	1.2	0.12	700	20	Pensacola Bay
Pensacola NAS	--	7,000	1.880	primary	17.0	1.70	7,000	1,800	Pensacola Bay
Saufley Field NAS	--	1,600	0.216	secondary	2.1	0.21	1,600	50	Perdido Bay
Port St. Joe	4,217	4,150	0.280	primary	7.5	0.35	4,150	1,200	St. Josephs Bay
Santa Rosa Is. Auth[1]	--	5,000	0.500	secondary	4.0	0.29	5,000	800	Santa Rosa Sound
Totals		263,685	27.829				271,150	103,855	

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[1] Serves Pensacola Beach

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TABLE P-2
BASIC DATA ON SOURCES OF INDUSTRIAL POLLUTION
(Excludes industries connected to municipal sewer systems)
CHOCTAWHATCHEE - PERDIDO BASINS

Location by State and County	Code	Number of Employees	Type of Industry	Type of Waste	Estimated Average Flow mgd	Treatment Provided	Estimated PE (BOD) Untr'd Waste	Estimated PE (BOD) Disch'd Waste	Discharged To
ALABAMA									
Baldwin	B	128	chemical	resins, oils	1.000	none	46,000	46,000	Branch-Hollinger Cr
Barbour	P	20	mining	iron ore	3.600	lagoon	--	--	Pea R
Butler	G	15	mining	iron ore	1.400	lagoon	--	--	Branch-Pigeon Cr
	H	15	mining	iron ore	1.400	lagoon	--	--	Branch-Pigeon Cr
	I	15	mining	iron ore	1.000	lagoon	--	--	Branch-Pigeon Cr
	J	25	mining	iron ore	2.000	lagoon	--	--	Branch-Pigeon Cr
	K	15	mining	iron ore	1.400	lagoon	--	--	Branch-Pigeon Cr
	L	15	mining	iron ore	1.400	lagoon	--	--	Branch-Pigeon Cr
	M	20	mining	iron ore	1.000	lagoon	--	--	Branch-Pigeon Cr
	N	20	mining	iron	0.700	lagoon	--	--	Branch-Pigeon Cr
Covington	A	110	chemical	resins, oils	0.215	settling & oil flotation	3,000	600	Branch-Five Run Cr
Crenshaw	C	15	mining	iron ore	1.000	lagoon	--	--	Conecuh R
	E	15	mining	iron ore	1.400	lagoon	--	--	Providence Cr-Conecuh R
	F	15	mining	iron ore	1.400	lagoon	--	--	Undet
Escambia	D	357	pulp & paper	paper board	24.288	settling	59,000	44,200	Conecuh R
Pike	O	15	mining	iron ore	1.400	lagoon	--	--	Branch-Conecuh R
	Q	20	mining	iron ore	1.400	lagoon	--	--	undetermined
	R	15	mining	iron ore	2.000	lagoon	--	--	Branch-Conecuh R
FLORIDA									
Bay	A	1,000	pulp & paper	cooling	34.560	none	--	--	St. Andrews Bay
				process	13.680	settling	171,450	137,000	St. Andrews Bay
Escambia	B	75	chemical	fluorides & silica	0.010	fluoride reclaim	--	--	Escambia Bay

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TABLE P-2 (CONT'D)
BASIC DATA ON SOURCES OF INDUSTRIAL POLLUTION
(Excludes industries connected to municipal sewer systems)
CHOCTAWHATCHEE - PERDIDO BASINS

Location by State and County	Code	Number of Employees	Type of Industry	Type of Waste	Estimated Average Flow mgd	Treatment Provided	Estimated PE (BOD) Untr'd Waste	Estimated PE (BOD) Disch'd Waste	Discharged To
FLORIDA - Cont'd									
Escambia	C	350	synthetic fiber	sanitary	0.005	septic tank	350	175	Escambia Bay
				organics	0.720	pH control & lagoon	7,650	3,060	Escambia Bay
	D	50	chemical	resins, oils	0.199	ponds	288	undet	Bayou Chico
	E	400	chemical	wood fiber & alkalies	1.500	settling	30,000	21,000	Bayou Chico
	F	6,000	textile	sanitary	0.360	primary	6,000	3,900	Escambia R
				alkalies	1.000	biological & submerged combustion	202,000	4,040	Escambia R
	G	175	metals	alkalies	0.720	settling	--	--	Swamp-Escambia Bay
	H	260	chemical	alkalies	3.890	none	--	--	Escambia Bay
	I	500	chemical	resins, oils	2.510	neutralize & settle	13,500	13,500	Bayou Chico
	J	1,987	pulp & paper	process	32.000	aeration settling lagoon	170,000	144,000	11 Mile Cr-Perdido Bay
Gulf	K	42	chemical	acids & oils	0.037	none	15,000	15,000	St. Joseph Bay
	M	800	pulp & paper	process	32.000	settling	125,000	100,000	St. Joseph Bay
				cooling	11.000	none	--	--	St. Joseph Bay
Totals					182.195		849,500	495,675	

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Florala, Georgiana, Hartford, Luverne, Samson and Slocumb in Alabama and Bonifay, Crestview, and Graceville in Florida. These conditions do not persist for any appreciable distance downstream. North Bay and Pensacola Bay are dark and turbid at the sewer outlets of Lynn Haven, and Pensacola respectively. At Port St. Joe, the St. Josephs Bay water is tan colored and turbid at the sewer outlet.

A branch of Five Run Creek in Covington County, Alabama is colored dark yellow and has a turpentine odor. In Baldwin County, Alabama a branch of Hollinger Creek is highly colored and turbid and has a strong odor, low dissolved oxygen, and a rather high phenol content. The Conecuh River is stained with iron below one of the mines in Crenshaw County, Alabama, and an unnamed stream in Pike County, Alabama is also stained below a mine. Several of the streams that receive iron wastes are muddy for some distance below the points of wastes discharge. Escambia Bay is gray and has a chemical odor and some turbidity at the point where wastes from a synthetic fiber plant enter it. Bayou Chico is yellow and highly turbid with some scum at the waste outlet of a plant producing resins; and is brown, oily and turbid with a turpentine odor at the discharge point of a naval stores industry. Eleven Mile Creek, which receives waste from a pulp and paper mill, is reported to be dark, slightly turbid and to contain some deposits.

Bayou Chico (Escambia County, Florida) is in a somewhat unhealthy condition due to the industrial wastes that it has received during the past 50 years. The discharge of natural wood fibers has resulted in the development of numerous sludge banks, some of which are 20 feet or more in thickness. The decomposition of these sludge banks have resulted in anaerobic conditions in many parts of the Bayou. Other industrial wastes being discharged to the Bayou and causing objectional conditions are as follows: rosins, synthetic resin process wastes, cooling water and oily material. The effluent from the three sewage treatment plants should be considered as having a negligible effect on the Bayou as far as the BOD loading is concerned. The water in the Bayou has very little circulation; thus causing a continuous accumulation of wastes.

The Escambia River receives wastes from industries in both Alabama and Florida which apparently have little effect on the river. In the past, the ammonia content of the liquid waste from two industries caused numerous fish kills in Escambia Bay. This problem has apparently been corrected by waste reduction through in-plant recovery processes.

The above information is based upon reports and observations made by the Alabama Water Improvement Commission and the Florida State Board of Health.

POLLUTION ABATEMENT REQUIREMENTS FOR 1960

SEWERAGE

At the present time, 47 municipalities in the Basin serve only a part of their populations and 17 municipalities with populations of 800 or more have no sewage collection system. The 47 municipalities with existing systems should extend their collection systems to serve an additional 69,500 persons, and the 17 municipalities should construct new collection systems to serve 90,400 persons. The total capital outlay required as shown in Table P-3 is estimated to be $7,997,000.

TREATMENT FACILITIES

The degree of treatment required at each municipality has been determined on the basis of dilution water available during periods of low stream flow and/or downstream water use. Dilution water use requirements are discussed more fully in the LOW FLOW AUGMENTATION section of this memorandum.

Existing treatment facilities at 27 municipalities, sub-divisions, and institutions are adequate for present needs. These are Dothan, Enterprise, Ft. Rucker, Ozark, Robertsdale and Troy in Alabama and Chipley, DeFuniak Springs, Graceville, the Santa Rosa S/D in Gulf Breeze, the Springdale S/D in Mary Ester, Milton, the Santa Villa S/D and Whiting Field NAS in Milton, Niceville, Okaloosa Island Authority, Panama City, the Woodlawn S/D, the Navy Mine Lab and Tyndall AFB in Panama City, the Mayfair S/D, Montclair S/D, Moreno Ct. S/D, Correy Field AFB, Ellyson Field NAS and Saufley Field NAS in Pensacola, and Santa Rosa Island Authority in Florida.

Their are 24 municipalities which presently do not provide treatment or have only septic tanks and should construct new treatment plants. Of this total, 2 should construct secondary treatment plants, 11 should construct stabilization ponds, and 11 should construct primary treatment plants.

There are 30 municipalities, sub-divisions and institutions which should either make additions or enlargements to their existing treatment plants. Of these, 4 should add secondary units to existing primary treatment plants. The total capital outlay required for needed new construction and additions to existing sewage treatment plants is estimated to be $16,989,000 as shown in Table P-3.

Industrial liquid waste disposal by 17 of the industries surveyed is adequate at present. However, the remaining 13 industries should provide more satisfactory methods of waste treatment and disposal. Primary treatment should be provided by 2 of the industries and 7 should provide chemical precipitation. Neutralization should be provided by 2 industries, and 2 industries should provide aeration and settling.

OTHER NEEDS

A need exists, in the Choctawhatchee-Perdido Basin and other areas of the Southeast River Basins, to determine the effect of pollution from insecticides, pesticides, and herbicides and methods for its control.

A need also exists for pollution abatement measures to alleviate pollution in the coastal waters now closed to shellfish harvesting. A comprehensive study should be made to determine the sources and extent of the problem and to determine the economic feasibility of industrial and municipal sewage treatment required to adequately abate the pollution.

FUTURE POLLUTION ABATEMENT REQUIREMENTS

PROJECTIONS

There are 77 municipalities and institutions expected to have sewage works by 1975. For the purposes of this section the military installations in the Basin have been considered as one institution. As shown in Table P-5, the total PE of the sewage will be 797,500 before treatment and the PE after recommended treatment is estimated to be 136,200.

By the year 2000, 83 municipalities and institutions are expected to have sewage works. As shown in Table P-5, the total PE of the sewage will be 1,312,470 and the estimated PE after recommended treatment will be 240,300.

As shown in Table P-6, industrial wastes discharged by 30 industries will have a total PE before treatment of 1,370,100 and 2,746,300 by 1975 and 2000, respectively. These wastes will have an estimated total PE after recommended treatment of 248,800 and 543,300 by 1975 and 2000, respectively. These figures do not include 19 industries for which waste discharges are either undetermined or of an inorganic nature. It is assumed that all other industries in the Basin will discharge wastes to subsurface systems, evaporation ponds or to municipal sewerage systems.

SEWERAGE

Assuming that sewerage requirements for 1960 will have been met, additional sewerage construction will be required in 65 municipalities by 1975. These 65 municipalities will require extension of the sewage collection systems required for 1960 to serve an additional

TABLE P-3
MUNICIPAL POLLUTION ABATEMENT
ESTIMATED NEEDS AND COSTS* FOR 1960
CHOCTAWHATCHEE - PERDIDO BASINS

	Treatment Facilities		Estimated Costs in $1,000		
Municipality	Des'd for (1,000 PE)	Type Recommended	Sewerage	Treatment	Total
ALABAMA					
Andalusia	10.3	secondary	113	116	229
Atmore	9	secondary	59	748	807
Bay Minette	5.0	secondary	110	221	331
Brantley	1.0	secondary	6	23	29
Brewton	6.5	primary	115	366	481
Brundidge	2.5	secondary	65	45	110
Clayton	1.3	secondary	46	28	74
Clio	1.1	secondary	16	25	41
Dothan (part)	25.0	secondary	448	--	448
Napier Field	0.6	secondary	--	18	18
East Brewton	3.0	primary	46	222	268
Elba	4.3	primary	81	286	367
Enterprise	15.5	secondary	120	--	120
Evergreen	4.0	secondary	60	62	122
Flomaton	1.5	primary	13	134	147
Florala	3.7	secondary	35	57	92
Foley	3.0	primary	70	148	218
Fort Deposit	1.8	primary	38	68	106
Geneva	3.8	primary	52	258	310
Georgiana	2.5	secondary	50	316	366
Greenville	7.0	secondary	70	665	735
Hartford	2.3	secondary	25	41	66
Headland (part)	1.9	secondary	14	36	50
Lockhart	0.8	secondary	17	20	37
Louisville	1.6	secondary	45	32	77
Loxley	1.4	secondary	43	30	73
Luverne	2.5	primary	12	193	205
Midland City	1.6	secondary	43	32	75
New Brockton	1.7	secondary	52	33	85
Newton	1.3	primary	48	120	168
Opp	5.5	primary	50	339	389
Ozark	10.0	secondary	125	--	125
Robertsdale	2.5	secondary	28	--	28
Samson	2.0	primary	25	164	189
Slocomb	2.2	secondary	38	39	77
Troy	12.0	secondary	110	--	110

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TABLE P-3 (CONT'D)
MUNICIPAL POLLUTION ABATEMENT
ESTIMATED NEEDS AND COSTS* FOR 1960
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	Treatment Facilities		Estimated Costs in $1,000		
	Des'd for (1,000 PE)	Type Recommended	Sewerage	Treatment	Total
FLORIDA					
Baker	1.3	primary	50	120	170
Bonifay	2.5	primary	48	317	365
Brownsville	40.0	secondary	1,920	2,418	4,338
Cantonment	2.5	secondary	125	317	442
Century	3.5	primary	35	249	284
Chipley	3.0	primary	33	--	33
Crestview	7.5	secondary	85	140	225
DeFuniak Springs	4.8	secondary	71	--	71
Destin	5.0	secondary	250	545	795
Ensley	1.8	secondary	90	249	339
Fort Walton Beach	15.0	secondary	57	432	489
Graceville	2.5	secondary	15	--	15
Gulf Breeze					
Casablanca S/D	0.75	secondary	28	48	76
Santa Rosa S/D	0.35	secondary	7	--	7
Lynn Haven	3.0	secondary	138	367	505
Mary Esther	0.8	secondary	32	88	120
Mexico Beach	1.5	secondary	75	218	293
Niceville	5.0	secondary	44	--	44
Ocean City	4.0	secondary	200	458	658
Okaloosa Co. Is. Auth.	2.0	secondary	40	--	40
Panama City	30.0	secondary	340	--	340
	20.0	primary			
Panama City Beaches	10.0	secondary	133	865	998
Parker	2.7	secondary	135	335	470
Pensacola	55.0	secondary	337	1,595	1,932
Port St. Joe	7.5	secondary	4	306	310
Springfield	6.0	secondary	230	603	833
South Port	1.3	secondary	50	194	244
Valparaiso	6.0	secondary	299	603	902
Warrington	17.0	secondary	838	1,270	2,108
Military Installations			--	367	367
Totals			7,997	16,989	24,986

* Based on January 1, 1960 constant dollars.

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TABLE P-4
INDUSTRIAL POLLUTION ABATEMENT
ESTIMATED NEEDS AND COSTS* FOR 1960
CHOCTAWHATCHEE - PERDIDO BASINS

Location by State and County	Code	Type of Waste	Treatment Recommended	Est. Cost of Treatment $1,000
ALABAMA				
Baldwin	B	resins, oils	chemical precipitation	45
Covington	A	resins, oils	chemical precipitation	17
Escambia	D	pulp & paper	primary	380
FLORIDA				
Bay	A	pulp & paper	aeration & settling	430
Escambia	B	fluorides & silica	chemical precipitation	15
	D	resins, oils	chemical precipitation	16
	E	wood fiber & alkalies	chemical precipitation	120
	G	alkalies	neutralization	64
	H	alkalies	neutralization	160
	I	resins, oils	chemical precipitation	113
	J	pulp & paper	aeration & settling	430
Gulf	K	acids & oils	chemical precipitation	26
	M	pulp & paper	primary	500
Total				2,316

* Based on January 1, 1960 constant dollars.

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TABLE P-4
INDUSTRIAL POLLUTION ABATEMENT
ESTIMATED NEEDS AND COSTS* FOR 1960
CHOCTAWHATCHEE - PERDIDO BASINS

Location by State and County	Code	Type of Waste	Treatment Recommended	Est. Cost of Treatment $1,000
ALABAMA				
Baldwin	B	resins, oils	chemical precipitation	45
Covington	A	resins, oils	chemical precipitation	17
Escambia	D	pulp & paper	primary	380
FLORIDA				
Bay	A	pulp & paper	aeration & settling	430
Escambia	B	fluorides & silica	chemical precipitation	15
	D	resins, oils	chemical precipitation	16
	E	wood fiber & alkalies	chemical precipitation	120
	G	alkalies	neutralization	64
	H	alkalies	neutralization	160
	I	resins, oils	chemical precipitation	113
	J	pulp & paper	aeration & settling	430
Gulf	K	acids & oils	chemical precipitation	26
	M	pulp & paper	primary	500
Total				2,316

* Based on January 1, 1960 constant dollars.

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201,960 persons. As shown in Table P-7, the total capital outlay required for extension of sewerage systems is estimated to be $10,098,000 to meet 1975 needs.

By the year 2000, there will be a need for sewerage construction in 73 municipalities. These municipalities will require extension of the sewage collection systems recommended in 1960 and 1975 to serve an additional 467,740 persons. As shown in Table P-7, the total outlay required for extension of the sewage collection systems required to meet the needs by the year 2000 is estimated to be $23,387,000.

TREATMENT FACILITIES

The degree of treatment required at each municipality, institution, and industry has been determined on the basis of dilution water available during periods of low stream flow and/or downstream water use. In the upstream areas where low flows are not sufficient to protect water quality after secondary treatment, low flow augmentation is recommended. However, primary treatment only has been recommended for wastes discharged to tidewater unless secondary treatment is already provided.

The sewage treatment facilities recommended for 1960 will be adequate to meet the 1975 needs in 29 municipalities and institutions. Thirty-five other municipalities will need to enlarge either their existing treatment facilities or those recommended for 1960 to meet 1975 needs and nine municipalities will need to construct new treatment plants; 4 primary plants, 3 secondary plants, and 2 stabilization ponds. Of the 35 plant enlargements recommended, 7 are for primary plants, 26 for secondary plants and 2 for stabilization ponds. The total capital outlay required for municipal sewage treatment plant construction by 1975 is estimated to be $20,193,000 as shown in Table P-7.

The 30 industries in the Basin will need additional waste treatment facilities by 1975. The total capital outlay required for this construction is estimated to be $5,394,000 as shown in Table P-8.

Sewage treatment facilities recommended for 39 municipalities for 1975 will need to be enlarged to meet 2000 needs. In addition, 13 municipalities will need to enlarge their existing or recommended 1960 plants and 7 municipalities will need to construct new plants to meet 2000 needs. The total capital outlay required for municipal sewage treatment facilities needed by 2000 is estimated to be $36,434,000 as shown in Table P-7.

The waste treatment facilities recommended for the 26 industries for 1975 will need to be expanded to meet 2000 needs. The total capital outlay required for this expansion is estimated to be $7,515,000 as shown in Table P-8.

TABLE P-5
SOURCES OF MUNICIPAL SEWAGE - 1975 AND 2000
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	1975			2000		
	Treatment Recommended	PE Untreated Waste	PE Discharged Waste	Treatment Recommended	PE Untreated Waste	PE Discharged Waste
ALABAMA						
Andalusia	secondary	16,500	2,840	secondary	19,500	2,920
Ariton	primary	800	520	primary	1,000	650
Atmore	secondary	14,700	2,200	secondary	20,200	3,020
Atmore Prison	primary	700	450	primary	700	450
Bay Minette	secondary	9,300	1,400	secondary	16,000	2,400
Brantley	secondary	1,000	150	secondary	900	140
Brewton	primary	9,000	5,850	primary	15,500	10,700
Brundidge	secondary	3,100	470	secondary	4,300	650
Clayton	secondary	1,200	180	secondary	900	140
Clio	secondary	1,000	150	secondary	1,100	160
Daleville	secondary	800	120	secondary	1,000	150
Dothan (part)	secondary	35,000	5,250	secondary	57,000	8,550
Napier Field	secondary	600	90	secondary	600	90
East Brewton	primary	3,100	2,020	primary	4,300	2,800
Elba	primary	6,300	4,150	primary	8,700	5,650
Enterprise	secondary	24,400	3,660	secondary	29,900	4,480
Evergreen	secondary	5,000	750	secondary	6,900	1,030
Flomaton	primary	2,200	1,430	primary	2,900	1,890
Florala	secondary	3,700	560	secondary	5,000	750
Foley	primary	5,400	3,520	primary	7,400	4,800

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TABLE P-5 (CONT'D)
SOURCES OF MUNICIPAL SEWAGE - 1975 AND 2000
CHOCTAWHATCHEE - PERDIDO BASINS

	1975			2000		
Municipality	Treatment Recommended	PE Untreated Waste	PE Discharged Waste	Treatment Recommended	PE Untreated Waste	PE Discharged Waste
ALABAMA - Cont'd						
Fort Deposit	primary	1,600	1,040	primary	1,800	1,170
Geneva	primary	4,500	2,930	primary	6,200	4,030
Georgiana	secondary	2,500	380	secondary	3,400	510
Greenville	secondary	8,200	1,230	secondary	14,100	2,120
Gulf Shores	--	--	--	secondary	860	130
Hartford	secondary	2,300	350	secondary	3,100	470
Headland (part)	secondary	1,550	230	secondary	1,950	290
Kinston	--	--	--	secondary	870	130
Lockhart	secondary	750	110	secondary	600	90
Louisville	secondary	1,100	165	secondary	1,600	240
Loxley	secondary	1,000	150	secondary	1,360	200
Luverne	primary	2,250	1,460	primary	2,500	1,620
Midland City	secondary	1,100	165	secondary	1,600	240
New Brockton	secondary	1,300	200	secondary	1,700	250
Newton	primary	1,300	840	primary	2,100	1,360
Opp	secondary	7,800	1,170	secondary	13,400	2,000
Ozark	secondary	17,000	2,550	secondary	21,400	3,210
Robertsdale	secondary	2,600	390	secondary	3,600	540
Samson	primary	1,500	970	primary	1,200	780
Slocomb	secondary	1,600	240	primary	2,200	330
Summerdale	secondary	900	140	secondary	2,100	320
Troy	secondary	16,700	2,500	secondary	21,100	3,160

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TABLE P-5 (CONT'D)
SOURCES OF MUNICIPAL SEWAGE - 1975 AND 2000
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	1975 Treatment Recommended	1975 PE Untreated Waste	1975 PE Discharged Waste	2000 Treatment Recommended	2000 PE Untreated Waste	2000 PE Discharged Waste
FLORIDA						
Bagdad	secondary	1,000	150	secondary	1,700	260
Baker	primary	1,300	850	primary	2,100	1,370
Beacon Hill	--	--	--	primary	1,000	650
Bonifay	primary	2,500	1,630	primary	3,000	1,950
Brownsville	secondary	73,000	11,000	secondary	140,000	21,000
Cantonment	secondary	3,900	590	secondary	7,400	1,110
Caryville	primary	1,500	980	primary	3,100	2,000
Century	primary	3,500	2,280	primary	8,700	5,650
Chipley	primary	4,200	2,700	primary	6,400	4,200
Crestview	secondary	13,000	1,950	secondary	37,400	5,600
Defuniak Springs	secondary	7,000	1,050	secondary	22,500	3,380
Destin	secondary	5,000	750	secondary	5,000	750
Ensley	secondary	2,900	440	secondary	5,400	810
Fort Walton Beach	secondary	28,000	4,200	secondary	96,000	14,400
Graceville	secondary	3,400	510	secondary	8,400	1,260
Gulf Breeze	secondary	1,500	230	secondary	2,400	360
Jay	primary	900	570	primary	1,500	980
Lynn Haven	secondary	5,600	840	secondary	20,000	3,000
Mary Esther	secondary	1,600	240	secondary	3,500	530
Mexico Beach	secondary	1,500	230	secondary	1,500	230

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TABLE P-5 (CONT'D)
SOURCES OF MUNICIPAL SEWAGE - 1975 AND 2000
CHOCTAWHATCHEE - PERDIDO BASINS

Municipality	1975 Treatment Recommended	1975 PE Untreated Waste	1975 PE Discharged Waste	2000 Treatment Recommended	2000 PE Untreated Waste	2000 PE Discharged Waste
FLORIDA - Cont'd						
Milligan	primary	1,000	650	primary	1,650	1,070
Milton	secondary	7,100	1,060	secondary	21,900	3,280
Molino	--	--	--	primary	900	590
Niceville	secondary	6,700	1,000	secondary	16,900	2,540
Ocean City	secondary	5,400	810	secondary	8,800	1,320
Okaloosa Co. Is. Auth.	secondary	2,000	300	secondary	2,000	300
Pace	--	--	--	primary	1,100	710
Panama City	secondary	75,000	11,200	secondary	146,000	22,000
Panama City Beaches	secondary	10,000	1,500	secondary	25,000	3,750
Parker	secondary	4,200	630	secondary	7,900	1,180
Pensacola	secondary	125,000	19,000	secondary	250,000	37,500
Port St. Joe	secondary	6,000	900	secondary	13,800	2,070
Santa Rosa Is. Auth.	secondary	7,800	1,170	secondary	9,500	1,420
Shalimar	secondary	850	130	secondary	1,000	150
South Flomaton	--	--	--	primary	830	540
Southport	secondary	1,300	200	secondary	2,200	330
Springfield	secondary	6,000	900	secondary	7,600	1,150
Valparaiso	secondary	7,300	1,100	secondary	9,000	1,350
Vernon	--	--	--	primary	850	560

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TABLE P-5 (CONT'D)
SOURCES OF MUNICIPAL SEWAGE - 1975 AND 2000
CHOCTAWHATCHEE - PERDIDO BASINS

	1975			2000		
Municipality	Treatment Recommended	PE Untreated Waste	PE Discharged Waste	Treatment Recommended	PE Untreated Waste	PE Discharged Waste
FLORIDA - Cont'd						
Warrington	secondary	29,000	4,350	secondary	46,000	6,900
Military Ins	secondary	50,000	6,500	secondary	50,000	6,500
Totals		797,500	136,200		1,312,470	240,300

TABLE P-6
SOURCES OF INDUSTRIAL WASTE - 1975 AND 2000
(Excludes industries connected to municipal sewer systems)
CHOCTAWHATCHEE - PERDIDO BASINS

Location by State and County	Code	Treatment Recommended	1975			2000		
			Vol. of Waste mgd	PE Untreated Waste	PE Discharged Waste	Vol. of Waste mgd	PE Untreated Waste	PE Discharged Waste
ALABAMA								
Baldwin	B	chemical precipitation	1.370	63,000	12,600	1.250	57,500	11,500
Barbour	P	lagoon	5.400	--	--	8.100	--	--
Butler	G	lagoon	2.250	--	--	3.400	--	--
	H	lagoon	1.600	--	--	2.420	--	--
	I	lagoon	1.600	--	--	2.420	--	--
	J	lagoon	3.200	--	--	4.850	--	--
	K	lagoon	2.250	--	--	3.400	--	--
	L	lagoon	2.250	--	--	3.400	--	--
	M	lagoon	1.600	--	--	2.420	--	--
	N	lagoon	1.100	--	--	1.700	--	--
Covington	A	chemical precipitation	0.294	4,100	830	0.264	3,700	640
Crenshaw	C	lagoon	1.660	--	--	2.330	--	--
	E	lagoon	2.340	--	--	3.550	--	--
	F	lagoon	2.340	--	--	3.550	--	--
Escambia	D	primary	39.200	95,000	62,000	92.000	223,000	145,000
Pike	O	lagoon	2.340	--	--	3.270	--	--
	Q	lagoon	2.100	--	--	3.150	--	--
	R	lagoon	3.320	--	--	4.660	--	--
FLORIDA								
Bay	A	aeration & settling	22.000	275,000	41,000	51.600	650,000	100,000
Escambia	B	flouride reclaim, chemical precipitation	0.017	--	--	0.024	--	--
	C	pH control, lagoon	1.230	13,000	5,250	1.750	18,500	7,450

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TABLE P-6 (CONT'D)
SOURCES OF INDUSTRIAL WASTE - 1975 AND 2000
(Excludes industries connected to municipal sewer systems)
CHOCTAWHATCHEE - PERDIDO BASINS

Location by State and County	Code	Treatment Recommended	1975 Vol. of Waste mgd	1975 PE Untreated Waste	1975 PE Discharged Waste	2000 Vol. of Waste mgd	2000 PE Untreated Waste	2000 PE Discharged Waste
FLORIDA - Cont'd								
Escambia	D	chemical precipitation, ponds	0.280	400	undet	0.260	370	undet
	E	chemical precipitation settling	2.440	49,000	34,000	5.630	113,000	79,000
	F	primary	0.600	10,100	6,500	0.870	14,500	9,400
		biological submerged combustion	1.680	340,000	6,800	2.420	505,000	9,800
	G	neutralization	0.970	--	--	1.070	--	--
	H	neutralization	6.500	--	--	9.000	--	--
	I	chemical precipitation settling	3.500	19,000	3,800	3.100	16,700	3,300
	J	aeration & settling	51.500	274,000	41,000	120.000	638,000	100,000
Gulf	K	flotation chemical precipitation	0.062	25,000	5,000	0.088	36,000	7,200
	M	aeration & settling	52.000	203,000	30,000	120.000	470,000	70,000
Totals			219.000	1,370,100	248,800	462.000	2,746,300	543,300

TABLE P-7
MUNICIPAL POLLUTION ABATEMENT
ESTIMATED COSTS* - 1975 AND 2000
CHOCTAWHATCHEE - PERDIDO BASINS

	Estimated Costs in $1,000					
	1975			2000		
Municipality	Sewerage	Treatment	Total	Sewerage	Treatment	Total
ALABAMA						
Andalusia	147	536	683	120	225	345
Ariton	40	23	63	10	--	10
Atmore	181	595	776	220	575	795
Bay Minette	205	480	685	175	636	811
Brewton	134	123	257	170	366	536
Brundidge	30	18	48	60	27	87
Clio	4	--	4	5	--	5
Daleville	40	23	63	10	--	10
Dothan (part)	352	865	1,217	866	1,485	2,351
East Brewton	29	--	29	60	120	180
Elba	99	164	263	120	185	305
Enterprise	405	696	1,101	220	430	650
Evergreen	65	51	116	95	--	95
Flomaton	38	64	102	35	64	99
Florala	35	--	35	65	28	93
Foley	125	160	285	100	133	233
Fort Deposit	7	--	7	10	--	10
Geneva	33	50	83	85	121	206
Georgiana	20	--	20	45	114	159
Greenville	65	114	179	155	603	758
Gulf Shores	--	--	--	45	23	68
Hartford	18	--	18	40	14	54
Headland (part)	11	--	11	19	11	19
Kinston	--	--	--	45	23	68
Louisville	10	--	10	25	--	25
Loxley	8	--	8	18	--	17
Luverne	--	--	--	13	--	13
Midland City	13	--	13	25	--	25
New Brockton	10	--	10	20	--	20
Newton	17	--	17	40	74	114
Opp	115	475	590	145	512	657
Ozark	203	665	868	175	500	675
Robertsdale	56	--	56	50	139	189
Slocomb	10	--	10	30	--	30
Summerdale	45	37	82	60	--	60
Troy	160	545	705	175	458	633

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TABLE P-7 (CONT'D)
MUNICIPAL POLLUTION ABATEMENT
ESTIMATED COSTS* - 1975 AND 2000
CHOCTAWHATCHEE - PERDIDO BASINS

	Estimated Costs in $1,000					
	1975			2000		
Municipality	Sewerage	Treatment	Total	Sewerage	Treatment	Total
FLORIDA						
Bagdad	50	166	216	35	98	133
Baker	15	--	15	40	65	105
Beacon Hill	--	--	--	50	103	153
Bonifay	14	--	14	25	37	62
Brownsville	979	2,145	3,124	2,750	3,415	6,165
Cantonment	70	207	277	175	415	590
Caryville	75	134	209	80	140	220
Century	73	--	73	260	324	584
Chipley	52	114	166	110	176	286
Crestview	146	575	721	970	1,685	2,655
DeFuniak Springs	85	162	247	550	1,150	1,700
Ensley	53	174	227	125	317	442
Fort Walton Beach	543	1,042	1,585	2,700	3,335	6,035
Graceville	55	166	221	250	545	795
Gulf Breeze	20	88	108	45	154	199
Jay	45	218	263	30	--	30
Lynn Haven	126	329	455	510	1,180	1,690
Mary Esther	80	40	120	95	268	363
Milligan	50	103	153	33	81	114
Milton	128	174	302	520	1,150	1,670
Molino	--	--	--	45	97	142
Niceville	109	239	348	340	865	1,205
Ocean City	70	207	277	170	402	572
Pace	--	--	--	55	174	229
Panama City	1,334	2,355	3,689	2,850	3,445	6,295
Panama City Beaches	250	545	795	500	865	1,365
Parker	75	219	294	185	438	623
Pensacola	2,177	3,395	5,572	5,000	5,750	10,750
Port St. Joe	90	--	90	250	616	866
Santa Rosa Island	100	367	467	85	219	304
Shalimar	43	166	209	8	--	8
South Flomaton	--	--	--	42	89	131
Southport	15	--	15	45	154	199

TABLE P-7 (CONT'D)
MUNICIPAL POLLUTION ABATEMENT
ESTIMATED COSTS* - 1975 AND 2000
CHOCTAWHATCHEE - PERDIDO BASINS

	Estimated Costs in $1,000					
	1975			2000		
Municipality	Sewerage	Treatment	Total	Sewerage	Treatment	Total
FLORIDA - Cont'd						
Springfield	68	--	68	80	229	309
Valparaiso	66	193	259	85	239	324
Vernon	--	--	--	43	89	132
Warrington	312	986	1,298	700	1,270	1,970
Totals	10,098	20,193	30,291	23,387	36,434	59,821

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* Based on January 1, 1960 constant dollars.

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TABLE P-8
INDUSTRIAL POLLUTION ABATEMENT
ESTIMATED COSTS* - 1975 AND 2000
CHOCTAWHATCHEE - PERDIDO BASINS

Location by State and County	Code	Estimated Costs in $1,000 1975	 2000
ALABAMA			
Baldwin	B	17	--
Barbour	P	84	106
Butler	G	49	62
	H	40	48
	I	40	48
	J	63	80
	K	49	62
	L	49	62
	M	40	48
	N	32	40
Covington	A	6	--
Crenshaw	C	43	43
	E	53	64
	F	53	64
Escambia	D	353	717
Pike	O	53	64
	Q	45	56
	R	67	69
FLORIDA			
Bay	A	660	1,450
Escambia	B	10	10
	C	53	44
	D	32	--
	E	78	148
	F	777	895
	G	27	21
	H	122	122
	I	158	--
	J	1,500	1,800
Gulf	K	41	42
	M	800	1,350
Totals		5,394	7,515

* Based on January 1, 1960 constant dollars.

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LOW FLOW AUGMENTATION

GENERAL

A minimum standard of water quality for fish and aquatic life is a dissolved oxygen content of not less than 4 ppm. In determining the volume of stream flow and storage required to maintain this standard, the following assumptions were used:

1. Summer water temperatures.
2. Minimum flows are 7 day low flows occuring once in 10 years.
3. Physical characteristics and reaeration constant of streams vary as to location, size, etc. of stream.

Minimum stream flows required at locations in the Basin where liquid wastes are discharged were calculated on the basis of the estimated PE for the years 1960, 1975, and 2000. At least primary treatment was assumed for all locations, and if the required dilution flow exceeded the actual low flow, secondary treatment was recommended. The minimum flows are shown in Table P-9. Locations requiring minimum flows of less than 1.0 cfs by the year 2000 are not included in the table.

AREAS WHERE AUGMENTATION IS NOT NEEDED

There will be sufficient volumes of water available for adequate dilution (after recommended treatment) and no storage will be needed to maintain stream quality below the points of waste discharge from the following areas: Ariton, Elba, Evergreen, Flomaton, Fort Rucker, Geneva, Georgiana, Luverne, Newton, Opp, and Robertsdale in Alabama; and Bonifay, Caryville, Milligan, Molino and Vernon in Florida.

AREAS WHERE AUGMENTATION IS NEEDED

In several areas, the streams receiving wastes travel a short distance (1 to 5 miles) before reaching a larger stream with adequate flow. This results in polluted stream conditions for short distances during periods of low flow at the following areas: Brewton, Fort Deposit, East Brewton, Loxley, and Troy in Alabama; and Baker, Chipley, Century, Crestview, Graceview, Ensley, Jay and South Flomaton in Florida. Storage for augmentation of low stream flow or higher degree of treatment to maintain desirable water quality in the short distances involved is not considered the most economical solution to these pollution problems. Studies of alternate solutions, such as waste diversion, will be needed in these areas.

Waste discharges to other areas in the Basin will present greater problems, however, and are discussed below and are summarized in Table P-10:

TABLE P-9
MINIMUM FLOW REQUIREMENTS
CHOCTAWHATCHEE - PERDIDO BASIN

General Location	Receiving Stream	Water Required cfs		
		1960	1975	2000
ALABAMA				
Ariton	Pea River	-	1.9	2.4
Andalusia	Five Runs Cr-Yellow R	2.5	1.2	1.1
Andalusia	Conecuh R	1.6	4.9	5.9
Atmore	Brushy Cr-Perdido R	2.5	4.4	6.1
Bay Minette	Hollinger Cr-Styx R	15.4	21.7	22.1
Brewton[2]	Murder Cr-Conecuh R	156.7	250.3	572.4
East Brewton[1]	Murder Cr-Conecuh R	6.0	7.4	9.3
Total for Brewton area		162.7	257.7	581.7
Dothan (part)	Beaver Cr-L Choct R	6.3	10.5	17.1
Elba[1]	Pea River-Choct R	10.3	15.1	20.9
Enterprise	Blanket Cr-Double Bridges Cr	2.3	4.8	6.0
Enterprise	Indian Camp Cr-Stripling Cr	1.1	2.4	3.0
Evergreen	Murder Cr-Conecuh R	1.1	1.5	2.1
Flomaton[1]	Big Escambia Cr-Escambia R	3.4	5.3	7.0
Florala	Corner's Cr-Flat Cr	0.9	1.1	1.5
Foley[1, 3]	Wolf Cr-Wolf Bay	7.0	13.0	17.8
Fort Deposit[1]	Pigeon Cr-Conecuh R	3.6	3.8	4.3
Fort Rucker	Clay Bank Cr-Choct R	3.0	3.0	3.0
Geneva[1]	Pea River-Choct R	3.3	3.6	4.8
Geneva[1]	Double Bridges Cr-Choct R	6.0	7.2	10.1
Georgiana	Rocky Cr-Persimmons Cr	0.3	0.7	1.0
Greenville	Persimmons Cr-Sepulga R	2.1	2.5	4.2
Gulf Shores[3]	Canal to Wolf Bay	--	--	3.0
Luverne[1]	Patsaliga R-Conecuh R	5.3	5.5	6.0
Newton[1]	Choctawhatchee R	2.3	3.1	4.8
Opp[1, 4]	Lightwood Knot Cr-Yellow R	13.1	2.3	4.0
Ozark	Hurricane Cr-Choct R	2.9	5.2	6.5
Robertsdale	Blackwater R-Perdido R	0.4	0.8	1.1
Loxley	Blackwater R-Perdido R	0.3	0.3	0.4
Total for Blackwater R		0.7	1.1	1.5
Samson[1]	Pea R-Choct R	4.6	3.6	2.9
Troy	Double Cr-Conecuh R	1.5	3.2	4.5
Troy	Walnut Cr-Whitewater Cr	1.5	1.8	1.8

(2/12/62)

TABLE P-9 (CONT'D)

General Location	Receiving Stream	Water Required cfs 1960	1975	2000
FLORIDA				
Baker[1],	Penny Cr-Blackwater R	2.4	3.1	5.0
Beacon Hill[1]	Gulf of Mexico	--	--	14.4
Bonifay[1]	Holmes Cr-Choct R	5.7	6.0	7.2
Chipley[1]	Br-Holmes Cr-Choct R	7.7	10.0	15.4
Total for Holmes Cr at Chipley		13.4	16.0	22.6
Brownsville[3]	Perdido Bay	145.0	277.0	532.0
Cantonment	Big Rock Cr-Escambia R	0.8	1.2	2.2
Cantonment (Ind)	11 Mile Cr-Perdido Bay	51.0	82.2	191.4
Caryville[1]	Choctawhatchee R	--	9.0	18.6
Century[1]	Morse Cr-Escambia R	12.0	21.0	52.2
Crestview	Juniper Cr-Shoal R-Yellow R	18.0	31.2	90.0
DeFuniak Springs	Bruce Cr-Choct R	1.6	2.1	6.8
Destin[3]	Choct Bay	19.0	19.0	19.0
Ensley	Br-11 Mile Cr-Perdido Bay	0.5	0.9	1.6
Fort Walton Bch[3]	Santa Rosa Sound	46.0	106.4	364.8
Mary Esther[3]	Santa Rosa Sound	--	6.1	13.3
Okaloosa Is Auth[3]	Santa Rosa Sound	7.6	7.6	7.6
Eglin AFB - Field #9[3]	Santa Rosa Sound	undet	undet	undet
Total for Santa Rosa Sound at Fort Walton Beach		53.6	120.1	385.7
Graceville	Little Cr-Holmes Cr	0.7	1.0	2.5
Gulf Breeze[3]	Santa Rosa Sound	4.2	5.7	9.1
Santa Rosa Island Authority[3]	Santa Rosa Sound	19.0	29.6	36.5
Total for Santa Rosa Sound at Gulf Breeze		23.2	35.3	45.6
Jay[1]	Br-Escambia R	--	2.2	3.6
Lynn Haven[3]	North Bay	11.8	21.3	76.0
Southport[3]	North Bay	3.8	4.9	8.4
Total for North Bay at Lynn Haven		15.6	26.2	84.4
Mexico Beach[3]	Gulf of Mexico	--	--	4.2
Milligan[1]	Yellow River	--	2.4	3.8

(2/12/62)

TABLE P-9 (CONT'D)

General Location	Receiving Stream	Water Required cfs		
		1960	1975	2000
FLORIDA - Cont'd				
Milton	Blackwater R	17.5	27.0	83.4
Bagdad	Blackwater R	--	3.8	6.5
Whiting Field NAS	Clear Cr-Blackwater R	1.4	1.4	1.4
Total for Blackwater R at Milton		18.9	32.2	91.3
Molino[1]	Escambia R	--	--	3.4
Niceville[3]	Choctawhatchee Bay	17.0	25.5	64.2
Valparaiso[3]	Choctawhatchee Bay	22.8	27.7	34.2
Eglin AFB[3]	Choctawhatchee Bay	undet	undet	undet
Shalimar[3]	Choctawhatchee Bay	--	3.0	3.8
Ocean City[3]	Choctawhatchee Bay	15.5	20.5	33.5
Total for Choctawhatchee Bay at Niceville		55.3	76.7	135.7
Panama City[3]	St. Andrews Bay	775.8	1325.0	3000.0
Parker[3]	St. Andrews Bay	10.3	16.0	30.0
Springfield[3]	St. Andrews Bay	17.6	23.0	29.0
Total for St. Andrews Bay at Panama City		803.7	1364.0	3059.0
Panama City Bch[3]	ditch-Choct Bay	38.0	57.0	95.0
Pensacola[3]	Pensacola Bay	1205.5	1945.0	3485.0
Pensacola NAS[3]	Pensacola Bay	29.2	29.2	29.2
Warrington[3]	Pensacola Bay	63.6	87.4	140.6
Total for Pensacola Bay at Pensacola		1298.3	2061.6	3654.8
Port St. Joe[3]	St. Josephs Bay	1816.3	794.2	1838.8
South Flomaton[1]	Mill Cr-Escambia R	--	--	1.9
Vernon[1]	Holmes Cr	--	--	1.9
Tyndal AFB[3]	Gulf of Mexico	55.5	55.5	55.5

[1] Primary treatment for all wastes.
[2] Primary treatment for municipal sewage only.
[3] Discharge to tidewater.
[4] Should provide secondary treatment by 1975.

(2/12/62)

Tidewater Areas

Wastes from Foley and Gulf Shore in Alabama; and, Bagdad, Beacon Hill, Brownesville, Cantonment, Destin, Eglin AFB, Fort Walton Beach, Gulf Breeze, Lynn Haven, Mary Esther, Mexico Beach, Milton, Niceville, Ocean City, Okaloosa Island Authority, Panama City, Panama City Beach, Parker, Pensacola, Pensacola NAS, Port St. Joe, Santa Rosa Island Authority, Shalimar, Southport, Springfield, Tyndall AFB, Valparaiso, Warrington, and Whiting Field in Florida are discharged to tidewaters. Primary treatment has been recommended as a minimum requirement, although many of the above areas provide secondary treatment at the present time. However, secondary treatment has been recommended for areas near water recreation areas and for those areas with existing secondary treatment facilities.

Augmentation is seldom the solution to tidewater pollution. Other measures such as better dispersion of wastes by properly designed outfalls, controlled discharge to take full advantage of tidal movement, etc., are generally better solutions to tidewater pollution problems. Each area will require a detailed study to determine pollution abatement requirements.

Andalusia, Alabama

A portion of the wastes from Andalusia is discharged to Bay Branch of Five Runs Creek where there is insufficient drainage area to provide adequate dilution water during low flow or storage for augmentation. The remaining portion of the waste is discharged to the Conecuh River where the natural low flow is approximately 100 cfs. To avoid excessive degradation of Five Runs Creek all wastes should be diverted to the Conecuh River where there is ample flow.

Atmore, Alabama

Wastes from Atmore are discharged to Brushy Creek where there is insufficient drainage area to provide adequate dilution water during low flow or storage for augmentation. Brushy Creek will be polluted during periods of low flow for approximately 15 miles to its junction with the Perdido River.

Bay Minette, Alabama

Wastes from Bay Minette are discharged to Hollinger Creek where there is insufficient drainage area to provide adequate dilution water during low flow or storage for augmentation. Hollinger Creek will be polluted approximately 15 miles to its junction with the Styx River.

Enterprise, Alabama

A portion of the wastes from Enterprise is discharged to Blanket Creek when there is insufficient drainage area to provide adequate dilution water during low flow or storage for augmentation. Blanket Creek will be polluted approximately 10 miles to its junction with Double Bridges Creek where ample dilution water is available. The remaining portion of the water is discharged to Indian Camp Creek where there is insufficient drainage area to provide adequate dilution or storage for augmentation. As a result, Indian Camp Creek will be polluted during periods of low flow for approximately 5 miles.

Florala, Alabama

Wastes from Florala are discharged to Corner Creek where there is insufficient drainage area to provide adequate dilution water during low flow or storage for augmentation. Therefore, Corners Creek will be polluted 7-8 miles during periods of low flow.

Dothan, Alabama

Wastes from the Dothan area are discharged to both the Choctawhatchee-Perdido Basin and the Apalachicola-Chattahoochee-Flint Basin in approximately equal volumes in 1960. By 1975 and 2000 it is expected that 2/3 of the wastes will be discharged to the Choctawhatchee-Perdido Basin. At the point of discharge to Beaver Creek and the Little Choctawhatchee River there is insufficient drainage area to provide adequate dilution water during low flow or storage for augmentation. As a result Beaver Creek and Little Choctawhatchee River will be polluted during periods of low flow for about 12 miles to their junction with the Choctawhatchee River.

Greenville, Alabama

Wastes from Greenville are discharged to Persimmon Creek where the natural low flow is approximately 2.5 cfs. The wastes require for adequate dilution after secondary treatment 2.1, 2.5 and 4.2 cfs in 1960, 1975, and 2000, respectively. To avoid degradation of Persimmon Creek for 10-12 miles during low flow, storage should be provided. The required capacity is estimated to be 400 acre-feet.

Ozark, Alabama

Wastes from Ozark are discharged to Hurricane Creek where there is insufficient drainage area to provide adequate dilution water during low flow or storage for augmentation. As a result, Hurricane Creek will be polluted during periods of low flow for approximately 8 miles to its junction with the Choctawhatchee River.

Samson, Alabama

Wastes from Samson are now discharged to Boyenton Creek and Sandy Creek where there is little or no natural low flow. The wastes should be diverted to the Pea River where ample dilution water is available after primary treatment.

DeFuniak Springs, Florida

Wastes from DeFuniak Springs are discharged to Bruce Creek where there is insufficient drainage area to provide adequate dilution water during low flow or storage for augmentation. Bruce Creek will be polluted approximately 12 miles during low flow to the junction with the Choctawhatchee River.

ANNUAL COSTS AND BENEFITS

FINANCING

Municipalities can finance sewage works construction by general obligation bonds, revenue bonds, special assessments, or some combination of these methods. For municipalities with a population of less than 6000, the Alabama law permits the issuance of general obligation bonds, to be repaid within 30 years, up to a maximum of 5 percent of the evaluation of taxable property within the political sub-division. For municipalities with a population of greater than 6,000, general obligation bonds can be issued up to a maximum of 7 percent of the evaluation of taxable property within the political sub-division. Individual exceptions to this law have been made by the state legislature.

The Florida law permits issuance of general obligation bonds up to a maximum amount of 10 percent of the evaluation of taxable property within the political sub-division. Individual exceptions to this law have been made by the legislature.

Financial aid is available to municipalities in the form of Federal grant assistance under Public Law 660 as amended. The Federal Government will pay up to 30 percent of the estimated reasonable cost of construction of municipal sewage treatment works or $600,000, whichever is smaller. Eligible for assistance are construction of new treatment works, improvements to existing treatment facilities, intercepting sewers, outfall sewers, pumping, and such preliminary planning necessary for construction. To date, Atmore, Brundidge, Dothan, Enterprise, Evergreen, Fort Deposit, Hartford, Robertsdale and Troy in Alabama and Lynn Haven and Milton in Florida have participated in the Federal aid program constructing both interceptor sewers and/or sewage treatment plants and appurtenant works. Applications have been received and approved and Federal grant offers have been made to Brewton, Clayton, Dothan, Foley, Loxley, Opp and Ozark in Alabama and Bonifay and Pensa-

TABLE P-10
RESERVOIR STORAGE NEEDS
CHOCTAWHATCHEE-PERDIDO BASIN

GENERAL LOCATION	STORAGE IN ACRE-FEET		
	1960	1975	2000
Andalusia, Alabama	divert all wastes to Conecuh R		
Atmore, Alabama	insufficient drainage area		
Bay Minette, Alabama	insufficient drainage area		
Brewton, Alabama	not economically feasible		
Dothan, Alabama	insufficient drainage area		
Enterprise, Alabama	insufficient drainage area		
East Brewton, Alabama	not economically feasible		
Ft. Deposit, Alabama	not economically feasible		
Florala, Alabama	insufficient drainage area		
Greenville, Alabama	--	--	400
Loxley, Alabama	not economically feasible		
Ozark, Alabama	insufficient drainage area		
Samson, Alabama	divert to Pea River		
Troy, Alabama	not economically feasible		
Baker, Florida	not economically feasible		
Chipley, Florida	not economically feasible		
Century, Florida	not economically feasible		
Crestview, Florida	not economically feasible		
DeFuniak Springs, Florida	insufficient drainage area		
Graceview, Florida	not economically feasible		
Ensley, Florida	not economically feasible		
Jay, Florida	not economically feasible		
South Flomaton, Florida	not economically feasible		

cola in Florida.

Industries will undoubtedly finance their pollution abatement facilities with private capital by the most economical methods available to them at the time of construction.

ANNUAL COSTS FOR 1960

The annual cost of pollution abatement by municipalities and industries in the Basin in 1960 is estimated to be $2,668,800. This includes the annual equivalent capital cost of existing facilities in 1960, annual replacement, and operation and maintenance cost of existing facilities. A breakdown of the total annual cost is shown below:

	Municipal	Industrial
Annual equivalent capital cost	$1,750,000	$124,600
Annual replacement cost	4,200	32,700
Annual operation and maintenance cost	689,800	67,500
Total annual cost (existing)	$2,444,000	$224,800

The total capital outlay required to improve existing pollution abatement facilities to meet the 1960 needs is estimated to be $16,989,000 for 54 municipalities and $2,316,000 for 13 industries. These costs are shown in Tables P-3 and P-4.

ANNUAL COSTS BY 1975

The total capital outlay required for additional pollution abatement facilities needed by 1975 after 1960 needs have been met, is estimated to be $20,193,000 for 45 municipalities and $5,394,000 for 30 industries. These costs are shown in Tables P-7 and P-8.

The annual cost of pollution abatement by municipalities and industries by 1975 is estimated to be $6,963,000. This includes the annual equivalent capital cost of (1) existing facilities in 1960, (2) facilities recommended to meet 1960 needs, and (3) facilities recommended to meet 1975 needs. The replacement cost is based on the total investment by 1975 and the operation and maintenance cost is based on existing and recommended facilities for 1960 and 1975. A breakdown of total annual costs is shown below:

	Municipal	Industrial
Annual equivalent capital cost	$4,434,300	$499,000
Annual replacement cost	00	67,600
Annual operation and maintenance cost	1,674,900	287,200
Total annual cost (1975)	$6,109,200	$853,800

ANNUAL COSTS BY 2000

The total capital outlay required for additional pollution abatement facilities needed by the year 2000 is estimated to be $36,434,000 for 59 municipalities and $7,515,000 for 26 industries. These costs are shown in Tables P-7 and P-8.

The annual cost of pollution abatement by municipalities and industries by 2000 is estimated to be $11,190,000. This includes the equivalent capital cost, the replacement cost, and the operation and maintenance cost of existing facilities and all recommended improvements for 1960, 1975, and 2000. A breakdown of total annual costs is shown below:

	Municipal	Industrial
Annual equivalent capital cost	$7,339,200	$863,900
Annual replacement cost	00	78,800
Annual operation and maintenance cost	2,423,700	484,400
Total annual cost (2000)	$9,762,900	$1,427,100

BENEFITS

It is recognized that pollution control results in benefits to public health and to those economic activities associated with the use of water of improved quality. However, because there is no established market value for water, as a commodity sold in a competitive market, monetary benefits from improvement in quality of water now used or anticipated to be used in the future, from public or private sources, in the Basin are indeterminate. While pollution abatement does enhance fishing and recreational opportunities, protect health, preserve and improve property and aesthetic values, and assure future utility of water resources, these values are confined largely to the intangible or social realm.

Ordinarily for those functions for which no market values are clearly established their values may in some cases be derived or estimated indirectly from prices established in the market for similar or analagous effects or may be derived from the most economical cost of producing similar effects by an alternative means. In the case of pollution abatement, however, there are no established prices for similar effects since no analagous effect exists. Neither are there alternative means of providing similar effects since, in most cases, the most likely, least cost means of attaining the desired effects is used. Therefore, lacking adequate methodology for assessing social values, benefits from pollution abatement must, for the time being, be considered as intangible. In the absence of established or synthetic market values, since the benefits from pollution abatement are real although intangible, it is considered that benefits accruing from pollution control by conventional treatment processes are at least equal to the cost of providing the facilities.

Since knowledge of society's future needs is less complete and accurate than information of present requirements, there could well be a tendency to adopt a water quality standard that is at times too high. Such has not been the case in the development of costs in this memorandum, however, because only minimum requirements or needs have been expanded into the future.

SUMMARY

1960

At the present time there are 68 municipalities (which include 23 institutions) and 30 industries which discharge wastes, treated and untreated, into the surface waters of the Choctawhatchee-Perdido Basin.

The total volume of municipal and industrial wastes discharged to the waters of the Basin is estimated to be 210.0 mgd and the total PE 1,120,650 before treatment and 599,530 after treatment.

The existing (1960) total annual cost of pollution abatement by municipalities and industries in the Basin is estimated to be $2,668,800.

1975

By 1975, 77 municipalities and institutions and 30 industries are expected to discharge wastes to the surface waters of the Choctawhatchee-Perdido Basin. The total PE of these wastes is estimated to be 2,167,600 before treatment and 385,000 after recommended treatment.

Reservoir storage for low flow augmentation will not be needed in any areas by 1975. In 7 areas, receiving streams will not have sufficient drainage area to allow storage for low flow augmentation, and thus polluted water conditions will exist during natural low flow periods for several miles downstream. In 13 areas, the size and length of the receiving streams is such that low flow augmentation during periods of low flow would not be economically feasible and thus severely polluted conditions are expected to exist for short distances downstream. In 2 areas wastes should be diverted to other streams having ample dilution water.

The total annual cost of pollution abatement by municipalities and industries by 1975 is estimated to be $6,963,000. This total includes the cost of existing facilities and those needed to meet existing (1960) and projected 1975 needs.

2000

By 2000, 83 municipalities and institutions and 30 industries are expected to discharge wastes to the surface waters of the Choctawhatchee-Perdido Basin. The total PE of these wastes is estimated to be 4,058,800 before treatment and 783,600 after recommended treatment.

Reservoir storage will be needed in 1 area of the Basin by 2000. As in 1975, 7 areas which have insufficient drainage area to allow storage will be polluted for several miles downstream and in 13 other areas low flow augmentation will not be economically feasible and thus polluted conditions are expected to exist in localized areas.

The total annual cost of pollution abatement by municipalities and industries by 2000 is estimated to be $11,190,000. This value includes the cost of existing facilities and those needed to meet existing (1960) and projected 1975 and 2000 needs.

PH-1

PUBLIC HEALTH

PH-1-a

INTRODUCTION

This Technical Memorandum is written with the limitation that field data were not available for all phases. Presentation of data in the subject areas of Vector Control and Solid Wastes is based upon published material and on field studies done by the Communicable Disease Center of the Public Health Service. The information is general and portions cannot be applied specifically to the Basin, but their presentation will serve as a guide to the solution of Basin problems as well as broader State and Regional problems.

(6/15/62)

VECTOR CONTROL

INTRODUCTION

Vector problems and control efforts in this Basin may be subdivided into two segments -- urban and rural. In this study selected towns in the Basin over 1,000 population were grouped into the so-called urban setting. Many Alabama towns have modest mosquito larviciding and adulticiding programs. Most Florida counties have vector control programs centered in the towns which are primarily concerned with the control of mosquitoes and secondarily, with flies, rats, and other vectors. Most of these Florida programs are administratively in the county health departments which also operate sanitary landfills. In the rural areas, vector problems (except for 5 to 10 mile range fresh-water flood moquitoes) are mostly associated with the activities of individuals who solve them on an individual basis. Exceptions to these are in the insect control work of the following Florida counties: Jackson, Calhoun, Gulf, and Franklin; although control efforts in these counties are centered in and around urban areas. There is a countywide typhus control program in Coffee and Covington Counties in Alabama.

For long-range planning concerning land and water uses, emphasis has been given to recommendations that would result in an environment by the years 1975 and 2000 that would require only a minimum of repetitive pesticide application. This will not only minimize the cost of vector control programs to the public but will make them more effective.

EXISTING VECTOR PROBLEMS

Eastern encephalitis ("sleeping sickness") has caused serious losses among horses in the Basin. Mosquito vectors of this highly fatal human and horse disease are most prevalent in the swamps and marshes located close to and along the coast.

In recent years, primary local malaria transmission has been at extremely low levels. Alabama reported only one likely case in 1960. The number of malaria mosquitoes, Anopheles quadrimaculatus, remains about the same in the Basin as in years when malaria was prevalent. Travelers may bring malaria parasites back to this country from malarious areas of the earth, and cause malaria transmission in the Basin. Thus a continuance of mosquito control efforts coupled with surveillance will still be required for many years. Fresh-water pools and ponds with vegetation are favorite breeding places for malaria mosquitoes.

Typhus fever (flea-borne) was also a severe problem in Alabama and Florida during the 1930's and 1940's. During recent years improved sanitation practices (limiting the domestic rat's food and harborage) and the use of newer rat poisons and flea insecticides have reduced transmission of this disease to low levels. Only a few cases occur each year in Alabama and Florida. The pest control industry has played an important role in halting typhus transmission in the urban setting. Most of the remaining transmission of this disease appears to take place in rural areas.

There is considerable transmission of various enteric infections by houseflies. Determination of precise case rates are difficult because of many factors, including difficulties of diagnosis and many patients not seeking medical help.

Rocky Mountain spotted fever occurs ocassionally in Alabama and Florida. Increased use and number of recreational areas and construction of outlying suburban housing areas appear to increase the possibility of American dog ticks transmitting Rocky Mountain spotted fever to humans. It is noteworthy that in eastern United States the incidence of this disease has been highest among vacationists and picnickers, particularly among women and children.

Conjunctivitis (pink-eye), a common disease of younger children, is a considerable problem in the non-coastal portions of this Basin and is confined largely to rural areas. One mode of transmission of this disease is by eye gnats (Hippelates). Oviposition of these insects occurs in freshly cultivated or otherwise disturbed soil.

The coastal area of this Basin with extensive tidal marshland is notorious for biting insects. Salt-marsh mosquitoes and dog flies, Stomoxys calcitrans, occur in large numbers and cause great annoyance to the residents and visitors to recreational areas. At times these insects occur in such overwhelming numbers that outdoor activities during the day or night are practically impossible. Large broods of salt-marsh mosquitoes frequently occur following unusually high tides or heavy rains. Peak populations of dog flies usually occur in August through October. After a long period of relative freedom from annoyance, a heavy influx of dog flies suddenly appeared at all beaches from Apalachicola to Pensacola at about 10:00 a.m. on August 30, 1960. At about the same time, the wind shifted to the north after blowing from the south for several days. The principal breeding place of the dog flies has been believed to be in bay grasses thrown up on the shores of bays. Control program personnel sprayed DDT on these grasses in order to kill the larvae.

Fresh-water swamps, marshes, and low-lying areas that receive floodwater are also important sources of mosquitoes.

Sand flies, deer flies, horse flies, and other biting insects occasionally occur in great numbers causing extreme annoyance to residents and visitors.

(6/15/62)

Throughout the Basin, numerous small patches of alligatorweed and water hyacinths are found in the small ditches and drainage creeks. Both of these obnoxious weeds were introduced from tropical areas into the United States and are spreading except in places where control work is being effected. Profuse growth of these weeds tend to clog drainage ditches, canals, ponds, etc., creating conditions favorable for malaria mosquitoes. Many other similar aquatic plants are profusely present, especially in Florida portions of the Basin. There are Federal programs that plan for the eradication of obnoxious weeds.

In urban areas, vector problems are frequently associated with improper disposal of sewage wastes. Severe Culex mosquito problems have developed where communities discharge improperly treated sewage wastes into swampy or impounded areas near town. In about 15 percent of the towns studied, overflowing septic tanks are a problem, and create ideal places for the breeding of Culex mosquitoes. Sewage stabilization ponds are beginning to appear in the Basin and could cause mosquito breeding problems unless they are properly operated and maintained free from weeds.

Housefly, rodent, and roach problems in cities and rural areas are usually associated with inadequate refuse storage and disposal practices. In addition, many business and residential lots are littered with garbage, tin cans, bottles, tires, worthless lumber, and discarded junk. Refuse collection schedules in urban areas are usually adequate (daily service in business areas and twice weekly service in residential areas is needed for effective vector control). Many towns have only a weekly pick-up service in residential areas. A few of the larger counties have commendable countywide refuse collection systems. Refuse disposal practices are deficient, in many portions of the Basin. Illegal dumping along county roads was mentioned as a bad problem by several directors of sanitation.

About 25 percent of the homes in the urban areas do not meet minimum sanitation standards and thus have associated fly, rat, and mosquito problems. Local directors of sanitation are aware of vector problems in substandard housing and the need for corrective programs.

Management of water in rural areas give rise to a variety of insect vector problems. Inadequacies of general drainage construction and maintenance contribute to mosquito breeding. Most small creeks, canals, and drainage ditches receive little or no maintenance. Frequently, individual farmers and towns cannot construct the small drainage ditches necessary because of the lack of or clogging of the large drainage canals in the county system.

Recent increased construction rates of large impoundments is viewed with concern by State Departments of Health with regard to possible encephalitis transmission. Particular concern is the type of reservoir that has a large acreage of shallow water in which aquatic vegetation and mosquitoes could grow profusely.

(6/15/62)

There are numerous farm ponds in this Basin and many more are being constructed each year. Mosquito breeding in farm ponds in the Alabama portion of the Basin has not been serious due to the present construction and operating procedures. Farm ponds in Florida seem to have more aquatic vegetation and suitable environment for mosquito breeding. Several local health department directors of sanitation stated that most farm ponds in their areas were constructed in low swampy areas that formerly bred many fresh-water flood mosquitoes, and that the construction of farm ponds has reduced mosquito annoyance in the area by changing mosquitoes from fresh-water flood species to permanent fresh-water species.

Irrigation (sprinkler type) is increasing, and is used for such crops as tobacco, corn, and for pastures. No significant mosquito problems have developed from the proper application of irrigation water to the fields.

Local sanitarians report the existence of many wastefully flowing artesian wells. Known mosquito production associated with artesian wells has not been heavy.

Vector problems associated with land resource activities also include those related to the production of livestock and poultry.

Hog parlors are beginning to spring up all over the Southeastern States. A common practice is to wash waste accumulations from the concrete floors of the parlors to an open septic tank and the overflow discharges into the nearest low, swampy area. This method of disposal frequently causes heavy housefly breeding. Hog parlors also may have considerable rat infestations.

Chicken "factories" are also found over the Southeast. A large number of them are found in this Basin. In egg factories, the birds are usually kept in small elevated cages, beneath which cones of manure accumulate on dirt floors. Major fly and rodent problems frequently develop where there is poor housekeeping. In another type of egg and chicken factory, the chickens are kept on a deep bed of wood shavings which is removed only occasionally. Waste chicken feed from a power conveyor and water wastage plus the accumulation of manure creates a favorable breeding place for flies. One chicken factory in Alabama has been screened by the operator and this has greatly reduced the fly problem.

Solid waste material (principally manure) on farms appears to be increasing at greater rates and requires frequent spreading on fields for sanitary disposal without creating a fly problem. The spreading of such wastes on fields at frequent intervals may be difficult due to crop growing requirements and manpower requirements.

Many fire ant mounds were noted in the Basin and several counties have or have had chemical control programs. Fire ant stings, usually quite rare in man, may be severe. Local sanitarians in this Basin report the occurrence of many stings in their counties. The mounds are not only unsightly but detrimental to agricultural operations. Wildlife and water supplies must be protected in chemical control programs.

STATUS OF EXISTING PROGRAMS

There is no statewide enabling legislation for the establishment of mosquito or vector control districts in Alabama, although local governmental units have authority by State law to conduct mosquito control work. Adequate legislation of this nature does exist in Florida.

Both Alabama and Florida have specific health regulations pertaining to the impounding of water. Permits are issued for the construction of farm ponds built to comply with State Board of Health regulations. As of February 1961, the Alabama State Department of Health had records of 13,580 farm ponds in the State.

Supportive services for vector control operations include:

1. Surveillance. Health agencies are concerned with a continuing analysis of vector problems to guide the efforts of other activities.

2. Research. The Florida State Board of Health has a large Entomological Research Center at Vero Beach, Florida which is working on the control of insects affecting human health. Research on vector control is also being carried on at two Federal stations in the area -- the Orlando, Florida Laboratory of the Entomology Research Division (USDA) and the Technical Development Laboratories of the Communicable Disease Center (USPHS), Savannah, Georgia. In Pensacola, Florida, the Public Health Service, in cooperation with the involved State and local health departments, is attempting to eradicate the yellow fever mosquito, Aedes aegypti. Now in its third year of operation, the project is making excellent progress toward the eradication goal. Public education, environmental sanitation, and DDT residual premise spraying methods are being utilized.

3. Technical assistance. Health agencies provide technical assistance to construction and operating agencies in planning and carrying out vector control operations. Local sanitarians give technical advice and assistance to local communities and to individuals.

Present vector control programs in the Florida portion of the Basin consist of six countywide vector control programs centered in health departments. Operations are centered on sanitary landfilling, bay beach larviciding for the control of dog flies, and ditching and adulticiding for the control of mosquitoes.

In the Alabama portion of the Basin, vector control programs consist of several city mosquito control programs and two countywide typhus and rodent control programs. Most of the city mosquito control activities are given over to adulticiding measures.

Several military bases are located in this Basin. All of them have vector control programs.

EXISTING NEEDS

There is a need for more emphasis to mosquito larviciding and permanent control measures. Each county needs at least one dragline for mosquito work. Each city in the district should have from one to several year-round mosquito control workers who would inspect for larvae during the mosquito season, apply larvicides to mosquito breeding areas, operate adulticiding machines occasionally when large mosquito infestations occur, and do maintenance and minor ditch construction during winter months.

Legislative and regulatory needs include:

1. State enabling legislation permitting the establishment of tax-supported vector control districts in any county of Alabama.

2. Regulations to require the control of wasteful flow from artesian wells.

Needs pertaining to surveillance and technical assistance include:

1. Extensive surveys of vector disease occurrence and vector problems.

2. Increased training of local health department personnel in vector control intelligence.

3. Expansion of entomologic and engineering consultative services to agencies, industries, and individuals concerned with water and related land resource development.

Some of the major research needs are:

1. Development of better permanent control techniques in saltmarshes that will control mosquitoes, sand flies, and other vectors and at the same time be helpful to other interests, such as wildlife conservation.

2. Development of better equipment and methods for constructing and maintaining water management ditches.

3. Improved methods for the sanitary handling of manure and other wastes on livestock and poultry farms including the possible use of stabilization ponds for disposal of wastes and for irrigation and fertilization.

4. Development of new agricultural and industrial uses for idle coastal land.

5. Improved design for catch basins so that they do not hold water.

6. Development of new or modified chemical formulations which would overcome insecticide resistance problems and present less danger to water supplies.

7. Development of improved equipment and application techniques for chemical control of vectors in urban areas.

Vector control program needs include:

1. Establishment of vector control districts in Baldwin County, Alabama and Escambia, Santa Rosa, and Okaloosa Counties, Florida. Each district would need about 3 draglines for permanent control work.

2. The development of countywide water management systems and programs.

3. Extension of the use of sanitary landfills to all towns and counties in the Basin. Many low lands exist in the Basin that could be filled profitably using the sanitary landfill method.

4. Increased implementation of Federal programs by State and local interests to eradicate infestations of alligatorweed, and water hyacinths and all obnoxious weeds in the Basin.

State aid to organized mosquito control agencies in Florida has proven very successful. State aid in Florida includes funds, supplies, services, and equipment. Sanitary landfill operations also come under the State aids program and have been most instrumental in starting and continuing these fills in Florida. Similar State aid funds and technical assistance are needed to solve the problem in Alabama.

In order that vector control programs will be compatible with multipurpose functions, it is essential that there be coordination between all interests concerned.

POTENTIAL PROBLEMS AND SOLUTIONS

Based on present knowledge, the one vector problem that appears to be on the rise and could be a significant one in the Basin is moquito-borne encephalitis -- both the Eastern and St. Louis strains. Eastern encephalitis has caused serious losses among horses in the Basin. Sooner or later it could cause epidemics among man, as was true in New Jersey in 1959 (this constituted New Jersey's first confirmed human cases, even though it had killed horses there for at least 50 years). The Eastern disease occurs principally in areas with vast fresh-water swamps and salt marshes (Coastal Plain).

St. Louis encephalitis -- a human disease - is not known to have occurred in the Basin, but it has recently been reported in Pinellas County, Florida. This disease presents a threat to communities in the Basin that allow uncontrolled production of Culex mosquitoes.

On the basis of current knowledge concerning mosquito-borne encephalitis, the only feasible approach to control of the disease is a program of prevention -- mosquito control for the community (or population groups) and protection against mosquito bites for the individual.

Increases in transmission of enteric infections by houseflies could increase due to changes in agricultural practices together with further "suburbia" developments.

COSTS AND BENEFITS

The principal benefit of any well-organized vector control program is to provide adequate safeguard to the public health. This includes freedom of disease and infirmity which is difficult to evaluate in dollars. Recent research studies have shown, especially in small children, that permanent brain and motor damage frequently result in cases of mosquito-borne encephalitis. The prevention of just one death or case of permanent damage would amply justify the amount of money proposed for vector control work in any one of the towns or counties in this Basin.

Additional benefits of vector control programs would be an acceleration of development and use of waterfront land. It is common knowledge that excessive numbers of salt-marsh mosquitoes, sand flies, dog flies, and other vectors on such land are an impediment to industrial plants, subdivision developments, and recreational areas.

Another benefit would be to provide economic safeguards, particularly with reference to tourism or resort areas. This is exemplified by the 1959 outbreak of Eastern encephalitis in New Jersey. Although this outbreak involved only 33 human cases with 21 deaths during a 2-month period, it was estimated that the episode caused a loss to Atlantic City hotelsof $2,000,000.

The estimated costs of needed vector control programs are included in Table PH-1. Studies in the Chatham County, Georgia area have shown that the total cost of the mosquito control program is being substantially balanced by reduced costs to families in the purchase of household sprays, aerosol bombs, and repellents.

The estimated costs of rural rat control programs will be balanced several times by savings from rat damage to stored farm products.

TABLE PH-1
VECTOR PROBLEMS AND PROGRAMS
CHOCTAWHATCHEE-PERDIDO BASIN

City or County 1960 Population	Vector Problem Degree 1	2	3	Approximate Annual Cost of Vector Control Program* Present	Needed	Refuse Disposal Method	Storm Water Drainage Problems	Open Water with Sewage Problems	Comments
ALABAMA									
Andalusia 10,263		F R	M T	$5,000	$10,000	Open dump	Light	Light	Moderate flea problem
Atmore 8,173	M F	F	T	3,000	20,000	Open dump	Severe	Moderate	Industrial wastes cause mosquito problems
Bay Minette 5,197		M	F R T	None	10,000	Open dump	Moderate	Light	Sewage treatment plant effluent causing mosquito problem
Brantley 1,014	M R	F	T	None	5,000	Open dump	Severe	Moderate	
Brewton 6,309	M		F R T	5,000	15,000	Open dump	Moderate	Moderate	Flood water mosquitoes are big problem
Brundidge 2,523		R	F M T	None	5,000	Open dump	Light	Light	Light flea problem
Clayton 1,313		R	M F T	150	5,000	Open dump	Light	Light	Moderate flea problem
East Brewton 2,511	M	F	R T	500	7,500	Open dump	Moderate	Light	Flood water mosquitoes are big problem
Elba 4,321	M	F R	T	None	10,000	Open dump	Severe	Moderate	Moderate flea problem
Enterprise 11,410		F R	M T	None	15,000	Open dump	Light	Light	Moderate flea problem

TABLE PH-1 (CONT'D)

City or County 1960 Population	Vector Problem Degree			Approximate Annual Cost of Vector Control Program*		Refuse Disposal Method	Storm Water Drainage Problems	Open Water with Sewage Problems	Comments
	1	2	3	Present	Needed				
Evergreen 3,703		M	F R T	3,000	8,000	Open dump	Moderate	Moderate	Moderate flea problem
Flomaton 1,454	M F	R T		600	5,000	Open dump	Severe	Moderate	Oil field wastes cause salt-marsh mosquito problems.
Florala 3,011	M	F R	T	900	10,000	Open dump	Moderate	Severe	Moderate flea problem
Foley 2,889		M	F R T	None	5,000	Open dump	Light	Light	
Geneva 3,840		M F	R T	1,900	10,000	Modified landfill	Severe	Light	Moderate flea problem
Georgiana 2,093	M F R		T	None	5,000	Open dump	Light	Light	Light flea problem
Greenville 6,894	M F R		T	2,000	20,000	Open burning dump	Light	Light	Light flea problem
Gulf Shore 356	M		R T	None	5,000	Open dump	Light	Light	
Hartford 1,956		M R	F T	900	5,000	Open dump	Light	Moderate	Moderate flea problem
Luverne 2,238	F	R	M T	None	5,000	Open dump	Light	Moderate	
New Brockton 1,093	F		M R T	None	5,000	Open dump	Light	Severe	Moderate flea problem
Opp 5,535		R	M T	1,800	5,000	Modified landfill	Light	Severe	Moderate flea problem

TABLE PH-1 (CONT'D)

City or County 1960 Population	Vector Problem Degree 1	Vector Problem Degree 2	Vector Problem Degree 3	Approximate Annual Cost of Vector Control Program* Present	Approximate Annual Cost of Vector Control Program* Needed	Refuse Disposal Method	Storm Water Drainage Problems	Open Water with Sewage Problems	Comments
Ozark 9,534		F R	M T	None	$10,000	Sanitary land-fill	Light	Light	Moderate flea problem
Robertsdale 1,474		M F	R T	None	5,000	Open dump	Light	Light	
Samson 1,932	R	M F	T	$ 400	6,000	Open dump	Light	Moderate	Moderate flea problem
Slocomb 1,368	R	M F	T	None	5,000	Open dump	Light	Moderate	Moderate flea problem
Troy 10,234		F	M R	None	10,000	Open dump	Light	Light	Light flea problem
Union Springs 3,704		F	M R T	2,000	6,000	Open dump	Severe	Moderate	
Baldwin County 49,088				None	25,000				Have severe mosquito, dog fly, and other vector problems in the coastal area
Coffee County 30,583				4,000	4,000				One-man countywide rodent control program
Covington County 35,631				5,000	5,000				One-man countywide rodent control program
FLORIDA									
Bonifay 2,222		F	M R T	None	3,500	Landfill covered once a month	Moderate	Moderate	
Chipley 3,159		F R	M T	See Washington County		Sanitary land-fill	Light	Light	

TABLE PH-1 (CONT'D)

City or County 1960 Population	Vector Problem Degree 1	Vector Problem Degree 2	Vector Problem Degree 3	Approximate Annual Cost of Vector Control Program* Present	Approximate Annual Cost of Vector Control Program* Needed	Refuse Disposal Method	Storm Water Drainage Problems	Open Water with Sewage Problems	Comments
Crestview 7,467		M F	R T	See Okaloosa County		Sanitary Landfill	Moderate	Light	
DeFuniak Springs 5,282			M R F T	See Walton County		Sanitary Landfill	Moderate	Light	
Ft. Walton Beach 12,147	F		M F R T	See Okaloosa County		Sanitary Landfill	Moderate	Light	
Milton 4,108		M F	R T	See Santa Rosa County		Sanitary Landfill	Light	Light	
Panama City 33,311	F	M	R F T	See Bay County		Sanitary Landfill	Moderate	Moderate	
Pensacola 56,752	F	M T F	R	See Escambia County		Sanitary Landfill	Moderate	Moderate	
Warrington 16,752	F	M T F	R	See Escambia County		Sanitary Landfill	Moderate	Severe	
Bay County 67,131				55,000	80,000				Vector program includes countywide system of SLF
Gulf District				30,000	40,000				
Escambia County 173,829				105,000	170,000				Vector program includes countywide system of SLF

TABLE PH-1 (CONT'D)

City or County 1960 Population	Vector Problem Degree			Approximate Annual Cost of Vector Control Program*		Refuse Disposal Method	Storm Water Drainage Problems	Open Water with Sewage Problems	Comments
	1	2	3	Present	Needed				
Holmes County 10,844				None	10,000				
Okaloosa County 61,175				34,000	40,000				Vector program includes sanitary landfill operations
Santa Rosa County 29,547				20,000	27,000				Vector program includes countywide system of SLF
Walton County 15,576				9,000	20,000				Vector program includes sanitary landfill operations
Washington County 15,576				7,000	10,000				Vector program includes sanitary landfill operations

*Costs of refuse collection and disposal are not included in this table.

1 - Severe	M - Mosquitoes
2 - Moderate	F - Flies
3 - Light	R - Rats
	T - Ticks

AIR POLLUTION

PROBLEMS

The Choctawhatchee-Perdido Basin has ten known major sources of industrial air pollution in Florida. These Florida air pollution sources consist of two sources in Pensacola, three in Escambia County outside the city limits of Pensacola, one in Bay County, three in Santa Rosa County and one at Port St. Joe.

The ten sources of air pollution are from one wood products processing plant, three pulp mills, one superphosphate plant, one nylon plant, one coal-fired stream-electric plant, and three chemical plants. These plants release gases, smoke, odors, and particulate matter to the atmosphere.

Airborne pollen, like in other basins of the SERB area, causes much discomfort to the general population.

No information is available on the municipal or private sources of air pollution in the Alabama portion of the Basin.

General information from Florida indicates that municipal air pollution problems are associated with garbage and burning trash dumps and sewage treatment plants. Commercial laundries often burn soft coal and have smoke problems.

STATUS OF EXISTING PROGRAMS

Public Law 159-84th Congress and its amendments provide for Federal technical services and financial aid to State and local government, air pollution control agencies, and other public or private agencies and institutions in the formulation and execution of their air pollution abatement research programs. The Surgeon General of the Public Health Service may (1) encourage cooperative activities by State and local governments for the prevention and abatement of air pollution, (2) collect and disseminate information relating to air pollution and the prevention and abatement thereof, (3) conduct investigations and research and make surveys, and (4) prepare and publish reports and make appropriate recommendations with regard to the control of air pollution.

The 1940 Code of Alabama, as amended, authorizes county boards of health to abate nuisances. The State Board of Health, under this Code, may declare certain things, acts or conditions to be public nuisances and a menace to public health. Air pollution control thus operates under the authority of this code.

The Florida State Board of Health has recently completed a survey of sources of air pollution and has published "A Report on

Florida's Air Resources." The 1957 Florida Air Pollution Control Act established an Air Pollution Control Commission in the State Board of Health and provided for the administrative organization to enforce air pollution control rules and regulations. The Act provided for establishment of air pollution control districts, but as of the present date none are operating in the SERB area. This survey data and authority for control provides a sound basis for carrying out an active and effective program.

Both Alabama and Florida State Health Departments cooperate with the Public Health Service in a national air sampling network. Urban sampling stations located in the SERB Area are Atlanta, Augusta, Savannah, Columbia, Oatland Island, and Macon, Georgia. Others are operated just outside the Basin Area in Mobile, Fort Morgan and Montgomery, Alabama, but no sampling station is located within the Basin.

EXISTING NEEDS

Available data indicates need for control of sources of air pollution in the Basin. Additional data from Alabama on the specific pollutants and the extent of the problem would be useful to correct the problems and meet the needs.

It is noted that most of the available data is for industrial sources of air pollution. Corrective measures should be determined and put in force for municipal, commercial, and private air polluters.

POTENTIAL PROBLEMS AND SOLUTIONS

The chemical, naval stores, and pulp industries are the major industries expected to expand production during the period 1960-2000. The types of air pollution expected from these industries would include fumes and gases, odors, particulate matter, and smoke. The chemical and pulp industries are expected to produce problems affecting fairly large areas.

Research has produced methods and devices that will eliminate gases, smoke, and particulate matter from the air. New industry should be required to install air pollution abatement devices and measures should be adopted now to control present polluters of the atmosphere.

Recommendations in "Florida's Air Resources" point out the solution to their State's air pollution problems as:

1. Adoption of legislation to permit and foster establishment and operation of county and multi-county air pollution control programs throughout the State.

2. Review and approval of plans for construction and alteration of establishments which may cause air pollution.

3. Enabling legislation to permit county-wide zoning.
4. Adequate staffing and financing to carry out a program of surveillance, control, assistance, and research in air pollution.

COSTS AND BENEFITS

The cost of control of air pollution cannot be evaluated since specific quantity and quality information is not available for the sources.

Benefits to be derived from air pollution abatement result from reduction in nuisances, effects on public health, and decrease in maintenance costs of buildings and of personal property. Benefits are considered to be equal to the costs of air pollution control.

RADIOLOGICAL HEALTH

PROBLEMS

Radiological health problems are best determined by considering all of the following sources of radiation: air, water, milk and food, and local sources such as medical and environment. The total effect of these sources is not known for the Choctawhatchee-Perdido Basin.

No nuclear reactors are located in this Basin, but surveillance work is carried out in Mobile Bay and on Dauphine Island near Mobile immediately outside the area. There are twenty-five licensed radioactive isotope users in the Florida portion and none in the Alabama portion of the Basin.

Data collected by State and Federal agencies on the radiological quality of the waters of the Basin are shown in Table PH-2.

STATUS OF EXISTING PROGRAMS

The Florida State Board of Health collected 3500 statewide water samples for radiological analysis during the period March 1958 to October 1960. The sampling program includes surface and ground water sources with permanent sampling stations on each watershed in the State.

Progress Report No. 4 - Radiological Surveillance Program, March 1958 through October 1960 of the Florida State Board of Health summarizes radioactivity in water as follows:

1. "A marked decrease in the radioactivity of surface waters and rainfall became apparent in the late spring of 1959 and continued until the French weapons testing the latter part of February 1960. The activity from this testing dropped off by May 1960 and continues to be undetectable.

2. An increase in the activity of underground water has not been found.

3. A few areas in the state, principally the phosphate ore bearing regions, have shown a little more alpha activity in both surface and underground waters than other portions of the state. This activity is negligible and much below maximum permissible levels."

The same general conclusions found by Florida also prevail in Alabama. No "hot" areas were found in Alabama; higher counts occurred during higher stream flows, and counts in the streams decreased after suspension of nuclear weapons tests in 1959.

TABLE PH2
RADIOACTIVITY IN WATER
CHOCTAWHATCHEE-PERDIDO BASIN

Sampling Station	Period of Analysis	No. of Analyses	Gross Alpha (uuc/l) Avg.	Gross Alpha (uuc/l) Max.	Gross Alpha (uuc/l) Avg.	Gross Beta (uuc/l) Avg.	Gross Beta (uuc/l) Max.	Gross Beta (uuc/l) Min.	Remarks
Alabama Surface Waters									
Choctawhatchee River near Geneva on Alabama Hwy 52.	1958-60	9	1.3	2.6	0.3	8.6	26.6	2.1	Seven of nine samples collected summer 1960.
Pea River near Geneva-County Road one mile S.W. of city	1958-60	9	1.6	6.2	0.2	14.5	50.0	5.2	Seven of nine samples collected summer 1960.
Escambia River east of Century, Florida	1958-60	11	1.8	3.5	0.4	27.3	70.6	2.1	
Florida Surface Waters Choctawhatchee Sub-Basin									
Choctawhatchee River at Careyville, U.S. Hwy 90 Bridge	1959-60	6	0.6(3)	1.2	0.2	34.4(4)	79.1	3.7	
Choctawhatchee River at Ebro	1959-60	4	0.1(1)			63.2	241.8	1.3	
Holmes Creek-Hwy 79 Bridge	1958-60	5				37.0(3)	102.5	3.6	
Big Sand Pond	1958	1				32.0			
Bector Pond-two miles north of Vernon	1958	1	0.3			27.0			
Pond-three miles west of Westville on Hwy 90	1958	1	0.3			17.0			
Lake at Hwy 98 and 30-A	1958	2	1.0	1.7	0.4	51.5	83.0	20.0	

(8/15/61)

TABLE PH2 (CONT'D)
RADIOACTIVITY IN WATER
CHOCTAWHATCHEE-PERDIDO BASIN

Sampling Station	Period of Analysis	No. of Analyses	Gross Alpha (uuc/1)			Gross Beta (uuc/1)			Remarks
			Avg.	Max.	Min.	Avg.	Max.	Min.	
Florida Surface Waters (Cont'd) Eastern Portion of Escambia Sub-Basin									
Yellow River, Hwy 87 Bridge	1959-60	6	1.4(4)	2.4	0.1	136.5(5)	633.3	3.5	
Bob Sikes Pond, east of Crestview	1958	2	0.4(1)			28.9	31.4	26.4	
Blackwater River, U.S. 90 Bridge	1959-60	3				29.7(2)	42.0	17.5	
Bass Pond, Ft. Walton Beach	1958	1	0.1			9.2			
Collins Mill Creek, Milton	1958	1	0.1			8.5			
Cypress Pond, Ft. Walton Beach near Mary Esther	1958	1				73.0			
Kepier Pond, Niceville	1958	1				24.0			
Earls Lake, Ft. Walton Bch.	1958	1				31.0			
Kennedy Lake, north of Crestview	1958	1				24.0			
Lake DeFuniak, DeFuniak Sprs.	1958	2				37.5	54.0	21.0	
Lake at Niceville Golf Course	1958	2	0.3	0.4	0.1	20.9	32.0	9.9	
Pond Creek at Hwy 90	1958	1				11.0			

(8/15/61)

TABLE PH2 (CONT'D)
RADIOACTIVITY IN WATER
CHOCTAWHATCHEE-PERDIDO BASIN

Sampling Station	Period of Analysis	No. of Analyses	Gross Alpha (uuc/1)			Gross Beta (uuc/1)			Remarks
			Avg.	Max.	Min.	Avg.	Max.	Min.	
Florida Surface Waters (Cont'd) **Perdido-Escambia Sub-Basin**									
Escambia River-Hwy 90 Bridge ½ mile below Chemstrand	1958	3	0.2(2)	0.3	0.1	15.6	33.6	5.5	
Escambia River-Hwy 184 Bridge	1959-60	6	0.8(3)	0.9	0.8	12.1(5)	36.4	1.0	
Perdido River at Muscogee	1958-60	7	0.4(3)	0.8	0.1	9.7(5)	28.0	1.3	
Gulf Pines Lake	1958	3	0.2(1)			35.5(2)	38.0	33.0	
Florida Ground Water									
Bonifay	1958	1				0.7			Deep well.
Chipley-municipal	1958-60	3	0.5(1)			3.1(1)			Deep well.
Chipley	1959-60	3				3.9(2)	4.0	3.8	Shallow well.
Panama City-19th and Beck	1960	1	0.6			0.7			Deep well-800 feet.
Panama City-1428 Balboa and 15th Street	1960	1	0.47			10.8			Shallow well.
Panama City Beach	1959-60	2	1.7(1)			5.8(1)			Municipal well.
Mexico Beach	1958	1				3.6			Municipal deep well.
Lynn Haven-well no. 1	1958	1	1.3			13.0			Regular mun. supply.
Panama City	1959-60	2	0.3	0.6	0.1	13.9	16.7	11.2	Shallow well.

(8/15/61)

TABLE PH2 (CONT'D)
RADIOACTIVITY IN WATER
CHOCTAWHATCHEE-PERDIDO BASIN

Sampling Station	Period of Analysis	No. of Analyses	Gross Alpha (uuc/1) Avg.	Gross Alpha (uuc/1) Max.	Gross Alpha (uuc/1) Min.	Gross Beta (uuc/1) Avg.	Gross Beta (uuc/1) Max.	Gross Beta (uuc/1) Min.	Remarks
Florida Ground Water (Cont'd)									
J.C. Turner north of Crestview Hwy 85	1959-60	3	0.4	0.6	0.2	3.7	5.0	2.7	Shallow well.
Crestview-well No. 2	1958-60	4	0.5(2)	0.7	0.4	2.4	4.7	1.0	Deep well-920 feet.
Casa Blanca S/D -composite of wells 1,2,5,6, and 7	1957	1	0.9			3.3			
Garnier Beach	1958	1				2.8			New well.
East Milton-well No. 2	1958	1	0.3			8.3			Deep well-160 feet.
St. Regis Paper Co. well No. 11, Cantonment	1959-60	2	0.3	0.4	0.2	3.6	4.8	2.4	Deep well.
Century - Hecker & Mayo St.	1960	1	2.3			7.0			Shallow well.
Chemstrand Corp., well No.2	1958	1	0.2			5.6			Deep well-385 feet.
Pensacola, Camp Franklin, 9th Avenue	1958	1	0.3			2.6			City well
Pensacola, Carlann Shores S/D	1959	1	4.9			13.0			Shallow well
Pensacola, Country Club	1958	1	0.2						Well
Florida-Miscellaneous Sources									
Columbia-National Effuent	1958	1	18.0			34.0			Zirconium Plant

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TABLE PH2 (CONT'D)
RADIOACTIVITY IN WATER
CHOCTAWHATCHEE-PERDIDO BASIN

Sampling Station	Period of Analysis	No. of Analyses	Gross Alpha (uuc/1)			Gross Beta (uuc/1)			Remarks
			Avg.	Max.	Min.	Avg.	Max.	Min.	
Florida-Miscellaneous Sources(Cont'd)									
Martins Pond-Crestview	1958	4	0.2	0.3	0.1	23.0	25.0	21.0	STP effluent
Escambia River-Hwy 90 Bridge ½ mile below Chemstrand	1958	1	4.2/g			1.5/g			Biological growth and silt
East Century-Hwy 4 Bridge	1959	1	166/g			Indet.			Fresh water clams
Panama City	1959-60	22	0.21(8)	0.3	0.12	55.8	472.	3.3	Rainfall

Note: Number in parentheses shows the number of analyses upon which the average was computed if different than the total number shown.

The Public Health Service, in cooperation with the Florida State Board of Health, operates one precipitation monitoring station and a water quality basic data station at Century, Florida on the Escambia River. The Florida State Board of Health, in cooperation with other agencies operates stations in four areas. A rainfall sampling station is located at Panama City in this Basin.

Other activities of the States include maintenance of a list of Atomic Energy Commission licensed isotope users. Florida survey sites for industrial users.

EXISTING NEEDS

The air phase of surveillance has never been undertaken by the States due to lack of funds, personnel, and equipment. Development of this phase of the program is increasingly important.

There is a need for control of radiological health hazards associated with the use and disposal of radioisotopes in the Basin.

Alabama needs additional funds and personnel to enable it to expand the water and air monitoring programs so as to establish a state-wide radiation background picture for future use. Assistance is also needed in a surveillance program for radioactive contamination of milk and food supplies.

POTENTIAL PROBLEMS AND SOLUTIONS

It is expected that the use of radioisotopes will increase in the future. Control of their use is a State responsibility. Funds and personnel should be made available that will permit the States to have a balanced and effective program.

Solutions to these problems include the following:

(1) Enactment of specific State legislation to control radioactive pollutants and license radioisotope users.

(2) Provision of additional funds and personnel for State-wide programs of control and monitoring of air, water, milk and food supplies.

SOLID WASTES

INTRODUCTION

Most communities collect and dispose of solid wastes as a governmental service, financing the operation by general taxation or by a special service charge. In a few instances, the collection and disposal is left to the individual producing the waste or to private collectors who charge a fee for the service.

Methods of disposal vary, including dumping (and burning) on the surface, placing in sanitary landfills, and incineration. The annual amount of solid wastes produced on a national average is 0.8 to 1.0 cubic yard or about 650 pounds per person per year (approximately 2 pounds per person per day).

Incineration is considered as one of the best methods of disposal but none of the communities in the Basin are using this method. Incineration of waste is not economical for small communities since it usually requires a population of 50,000 or more to support an efficient operation.

Sanitary landfills are the best method of waste disposal for any small community having suitable land available within reasonable hauling distance, and it can be used at a cost which is not prohibitive. It is an effective and proven method, accepted by the State Departments of Health.

PROBLEMS

Open dumps are the most common method of disposal used by small communities in the Basin, but this is not an acceptable method because of the health problems and nuisances created. Of the 68 cities or unincorporated communities for which information is available only thirteen, including two Air Force Bases operate an acceptable type of solid wastes disposal program. Twenty-seven others operate programs where certain types of wastes are burned on dumps or the fill is covered at other than daily intervals. The remaining 28 operate open dumps, and those other cities not reported in Alabama and Florida are assumed to operate open dumps. Small cities under 500 population usually leave the disposal problem to be handled on an individual basis. However, one of the 68 communities reported does have a population under 500.

Acceptable sanitary landfills are found in the cities of Ozark, Alabama and Lynn Haven, Panama City, Panama City Beach, Pensacola, Warrington, Crestview, Valparaiso, Wright, Fort Walton Beach, and Chipley, Florida. The 2 Air Force bases operating acceptable programs are Eglin and Hulbert in Okaloosa County, Florida. Six Florida counties in which a number of the acceptable city landfills are located operate countywide sanitary landfills in conjunction with vector control programs.

Modified landfills which permit some burning and less frequent than daily covering of wastes are operated by 2 Alabama and 25 Florida communities. Four small Florida communities and 24 Alabama communities are known to have open dumps.

Open dumps with burning of some garbage and combustible material are the common method of solid waste handling in small communities. This is not an acceptable method because unburned garbage and uncovered refuse become a major breeding place for insects and rodents, and burning dumps create an extensive smoke and odor problem. Costs, ignoring benefits, for dump operations are approximately 50 percent of that for sanitary landfills.

STATUS OF EXISTING PROGRAMS

State and local health departments have adequate authority to control the proper storage, collection, and disposal of solid refuse. However, it is usually considered and handled as a local problem with consultation from State departments of public health.

EXISTING NEEDS

There is a need in the Basin to provide approved waste disposal practices in an additional 36 communities which have a population sufficient to support a refuse collection and disposal program. In communities of under 500 population, good housekeeping practices can be practiced by the individual. Most communities will need to adopt regulations to enable them to cope with the problem.

POTENTIAL PROBLEMS AND SOLUTIONS

Large urban areas will find the use of incinerators more practicable where land areas for sanitary landfills are not conveniently available at reasonable costs.

By 1975, Pensacola, Florida, will need an incinerator to serve an estimated population of 100,000. In addition, there will be 81 sanitary landfill programs serving a total population of 444,000 persons.

By 2000, Pensacola, Ft. Walton Beach, Brownsville and Panama City will need incinerator programs to serve an estimated population of 507,000 persons. In addition, there will be 80 sanitary landfill programs serving a total population of 472,600 persons.

Land requirements for the communities operating sanitary landfills are based on a need of one acre per 10,000 population served per year. These requirements for the period 1960-2000 are shown in Table PH-3.

TABLE PH-3
LAND REQUIREMENTS FOR REFUSE DISPOSAL
1960-2000
CHOCTAWHATCHEE-PERDIDO BASINS

Period of Time	Number of Communities	Avg. Population to be served	Acres Required
1960-1964	40	214,000	110*
1965-1974	81	444,000	400
1975-2000	80	472,600	1,150
Total			1,660

*Does not include land requirements for modified landfills.

COSTS AND BENEFITS

Present costs for construction of incinerators ranges from $2000 to $4000 per ton daily capacity. Operational costs vary considerably with the City of Atlanta reporting $1.48 per ton for the year 1959, and $1.27 per ton for 1960. Other cities report costs two to three times this amount.

Costs of operation of sanitary landfills average $0.50 to $1.00 per ton of refuse handled. Cities as large as Los Angeles, California and New York City use this method of disposal. New York City's experience has shown that disposal by sanitary landfills costs approximately half that of incinerators.

Cost of operation of a solid refuse program including collection and disposal will vary with each community but will, depending on the size of the community, range from $1.00 to $4.50 per person per year. Based on a scaled cost, annual cost for a solid refuse program in the Choctawhatchee-Perdido Basin are shown on Table PH-4.

TABLE PH-4
SOLID WASTES PROGRAM ANNUAL COSTS
CHOCTAWHATCHEE-PERDIDO BASIN

Type of Operation	1960	1965	1975	2000
Incineration				
Capital Costs	--	--	19,400	99,100
Operation and Maintenance	--	--	100,000	510,000
Replacement	--	--	6,600	33,000
Sanitary Landfills				
Collection and Disposal	443,000	820,000	964,000	1,060,000
Total	$443,000	$820,000	$1,090,000	$1,702,100

The capital investment for incinerators is $400,000 in 1975 and $2,040,000 in the year 2000. Operation and maintenance annual costs for the incinerator program are based on $1.00 per person served. The total cost for the sanitary landfill program is considered to be all operation and maintenance. All operation and maintenance costs include collection as well as disposal of the solid refuse.

SUMMARY AND CONCLUSIONS

SUMMARY

Insect-borne diseases do not constitute a major health problem in the Basin under present conditions, but the following diseases do present a continuous threat: encephalitis, malaria, typhus fever, Rocky Mountain spotted fever, and conjunctivitis.

Other insect problems in the Basin are the dog flies and salt-marsh mosquitoes in seashore counties, and secondarily the houseflies and eye gnats.

Important vector problems due to man's activities include those associated with the disposal of sewage wastes, the storage, collection and disposal of refuse, water-holding catch basins, uncontrolled flow from artesian wells, and the accumulation and disposal of feed wastes and manure on farms.

There is no statewide enabling legislation for vector control districts in Alabama, but adequate legislation of this nature does exist in Florida.

Present vector control programs consist of six county-wide vector control programs and one beach area vector control district in Florida, all of which include excellent sanitary landfill operations. These programs are primarily for the control of mosquitoes and dog flies and secondarily against houseflies, rats, and other vectors. In Alabama, vector control programs consist of several city mosquito control programs and two countywide rodent control programs.

Ten major sources of air pollution are present in the Basin, and there are a number of other small local municipal and commercial sources. Studies to determine all sources of air pollution have been completed in Florida, but data is not available from Alabama.

The overall extent of the radiological health problem has not been determined. Air, water, and other monitoring programs are underway in Florida and to a lesser degree in Alabama. No problem areas have been found as a result of these limited monitoring activities, but slight increases in alpha activity in phosphate ore bearing regions have been noted.

Eleven communities and 2 military bases, serving 44 percent of the total population of the Basin have satisfactory methods of solid wastes disposal. Another eleven percent of the Basin population is served by solid disposal facilities which with little effort and expense could be operated satisfactorily. The remaining 45 percent of this population have inadequate methods of solid wastes disposal. Satisfactory municipal programs can be operated at a cost of $1.00 - $2.50 per person per year.

CONCLUSIONS

Control measures and supportive services needed to reduce public health problems associated with insect and rodent vectors are:

1. State enabling legislation permitting the establishment of tax-supported vector control districts in any county of Alabama.

2. Regulations requiring the control of wasteful flow from abandoned artesian wells.

3. More extensive surveys of vector disease occurrence and vector problems.

4. Increased training of local health department personnel in vector control intelligence.

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5. Expansion of entomologic and engineering consultative services to agencies, industries, and individuals concerned with water and land resource developments.

6. Development of better permanent control techniques in salt marshes that will serve multi-interests.

7. Development of better equipment and methods for constructing and maintaining water management ditches.

8. Establishment of mosquito control districts in Baldwin County, Alabama, and Escambia, Santa Rosa, Okaloosa, and Walton Counties, Florida.

9. Development of countywide water management systems and programs.

10. Improved design for catch basins so that they do not hold water.

11. Increased use of sanitary landfills in towns and in counties, and use of countywide refuse collection systems.

12. Increased use of sewers and central treatment plants in lieu of septic tanks in new subdivisions.

13. Development of improved methods for the sanitary handling of manure and other wastes on livestock and poultry farms.

14. Implementation of an increased program for the control and progressive eradication of alligatorweed and water hyacinths in the Basin.

15. Better coordination between agencies so that vector control programs are compatible with multipurpose functions.

16. Establishments of countywide rodent control programs where none exist.

17. Development of effective techniques for the control of eye gnats, and improved methods for control of dog flies.

18. Initiation of a state-aid financial program in Alabama.

The air pollution survey already completed in Florida should be utilized as a basis for the planning of future control programs. A similar study should be made in Alabama. Study and research should be undertaken immediately to determine the feasibility and desirability of controlling air pollution from the processing of pulp and the manufacturing of chemicals and wood product materials. Since the economy of controlling this particular source of air pollution is closely related with the control of water pollution from these industries, the two programs should be coordinated.

Funds are needed for the expansion of the radiological monitoring program in Alabama and to a lesser degree in Florida. This surveillance program on water, air, milk and food, and related items is essential in this nuclear age.

Satisfactory solid wastes programs should be started immediately in at least twenty-eight Alabama and Florida cities in the Basin. Funds for such a program ($1.00 - $2.50 annually per person) could be obtained through local taxation. Twenty-seven cities operating modified sanitary landfills should improve their operations. Estimated annual costs of providing adequate refuse collection and disposal programs of 1965, 1975, and 2000 are $820,000, $1,090,000, and $1,702,000 respectively. This includes the cost of an incinerator program in one city by 1975 and in 4 by 2000.

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APPENDICES AND BIBLIOGRAPHY

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APPENDIX
DEFINITIONS AND ABBREVIATIONS

1. cfs - cubic feet per second.
2. Garbage - putrescible animal and vegetable wastes resulting from the handling, preparation and consumption of foods.
3. gpcd - gallons per capita per day.
4. gpd - gallons per day.
5. mg - million gallons.
6. mgd - million gallons per day.
7. PE - population equivalent.
8. ppm - parts per million by weight.
9. Pollution, water - the addition of sewage, industrial wastes, or other harmful or objectionable material to water.
10. Quality, water - is defined as the expression of water characteristics in terms of its physical, chemical, bacteriological, biological, and radioactive content.
11. Resources, water - is defined as the water available to serve mankind and his civilization for the varied, complex, and often conflicting beneficial uses. These uses include sources for municipal and domestic supplies, agriculture, industrial development, and for recreation, propagation of aquatic life and other forms of wildlife, navigation and ultimate waste disposal.
12. Supplies, domestic water - are those supplies used for individual families, including those also serving tenant families living on the property. Domestic supplies do not include commercial establishments, schools, churches, or camps.
13. Supplies, industrial water - are considered as industrially owned supplies, primarily developed for process or cooling purposes but which might be incidentally used for sanitary purposes.
14. Supplies, municipal water - are public supplies serving a municipality or communities of 50 or more people.
15. Supplies, semi-public water - are supplies for schools, motels, camps, and other supplies serving water to the public; or commercial establishments not classed as municipal or industrial.
16. Wastes, municipal - include all liquid wastes received by community sewers.
17. Wastes, industrial - the liquid wastes from industrial processes as distinct from domestic or sanitary sewage.
18. Wastes, solid (or Refuse) - includes all wastes of a solid nature not otherwise disposed of to the sewers or to the atmosphere. This includes all putrescible and nonputrescible solid wastes such as garbage, rubbish, ashes, street cleanings, dead animals, abandoned automobiles, and solid market and industrial wastes.
19. Wastes stabilization ponds - a properly engineered and operated pond for the biological reduction of organic wastes.

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20. Water supply systems - includes the works and auxiliaries for collection, treatment and distribution of the water from the source of supply to the free-flowing outlet of the ultimate consumer.

Note: For the definition of any other terms which are used in this memoranda, refer to Glossary of Water and Sewage Control Engineering, 1949, American Society of Civil Engineers.

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